

A CASE STUDY OF ONE FAMILY'S  
EXPERIENCE WITH ASSISTIVE  
TECHNOLOGY

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By

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## Abstract

Although more widely used and sometimes legislated in other countries, assistive technology (AT) appears to be an elusive and poorly understood in special education practices in Saskatchewan. Although people are familiar with the larger mobility AT such as wheelchairs, walkers and computers, many educators and parents remain unaware of the potential benefits of using different types of AT in educational and residential settings. More importantly, until recently, there has been no foundation or framework to help educators and families decide on types of AT both available and suitable for those who require them. In the fall of 2006, Saskatchewan Learning will embark on a pilot project in AT policy and practices in school divisions across the province. Because the field of AT is so diverse, the researcher chose to focus on two autistic brothers at a school, and examined how AT was used to help increase their academic and social development at school and at home. This was a case study of two brothers with autism. It gives insight into one family's journey through the AT process. It is considered a journey, as it is an evolving process, one that changes and grows as the student does. The journey did not conclude with the completion of this thesis; it will grow through many interventions. This study showed how one school and family worked together to create a positive AT environment at school, which was transferred to the home environment. It highlighted the experiences of both family and staff members, and described how AT was integrated into the participants' program plans at the beginning of a school year. It also identified highlights and challenges the school team faced in implementing the AT process throughout the school year. Findings in the study indicated

that time is a significant factor in the programming, implementation and maintenance of the AT process. This study also indicated the importance of maintaining a clear focus on the objectives of the student and how the devices and strategies can support the individual. The research indicated that a bond must be formed between the home and school that promotes proper communication and goal sharing. Findings indicated that when strategies and devices are transferred between the home and school environment, attainment of skills happened quickly as more time was available to practice skills. Results also revealed that using AT enhanced learning for both participants in various domains of learning.

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## Table of Contents

Permission to Use.....	i
Abstract.....	ii
Acknowledgements.....	iv
Table of Contents .....	vi
List of Tables.....	viii
List of Figures .....	ix
Chapter One: Introduction	
Background .....	3
Purpose of Study.....	4
Research Questions.....	5
Significance of Study.....	6
Definitions.....	7
Delimitations.....	9
Limitations .....	10
Chapter Two: Review of Related Literature	
Introduction.....	11
Organization of Literature .....	12
Autism.....	12
Communication.....	15
Social Communication.....	16
Social Behavior.....	17
Communication Competence .....	17
Pragmatics.....	19
Personal Exchange Communication System .....	20
Augmentative and Alternative Communication .....	21
Social Participation .....	24
Social Stories .....	24
Comic Strip Conversation .....	26
Social Reciprocity.....	27
Programming .....	28
Personal Program Plan.....	28
SMART Goals .....	29
AT Pilot Project .....	30
Importance of Home/School Connection.....	32
Assistive Technology .....	33
AT and the P3 .....	37

Implementation .....	38
Abandonment.....	39
Quality of Life .....	41
AT Assessment .....	42
Chapter Three: Research Design and Methodology	
Research Design .....	45
Research Methodology .....	47
The Participants .....	47
The Family .....	50
The Researcher as the Special Educator .....	51
The Setting .....	53
The Method.....	53
The Framework.....	54
Data Collection .....	65
Data Analysis .....	66
Ethical Considerations.....	68
Chapter Four: Results	
Questionnaire Results .....	70
Student Questionnaire.....	70
Parent Questionnaire.....	72
Teacher and Teacher Assistant Questionnaire.....	83
Anecdotal Records and Observations .....	88
Student Finished Work Projects .....	97
Video Taped Presentations .....	100
Chapter Five: Analysis and Conclusions	
Discussion of Results.....	103
Analysis of Research Questions .....	103
Analysis of Research Question #1 .....	106
Analysis of Research Question #2 .....	107
Analysis of Research Question #3 .....	109
Analysis of Research Question #4 .....	110
On a Personal Note .....	113
Of Special Interest in Findings.....	116
Conclusions Drawn from Study .....	118
Extensions for Research .....	119
Chapter Six: Conclusion and Commentary	
Conclusion .....	121
Commentary.....	123
References .....	127
Appendices .....	132



## List of Tables

1. Sample Continuum of Assistive Technology	35
2. The SETT and Re-SETT Framework	55
3. Aspects of Assistive Technology Competence	59
4. Implementation of Assistive Technology Device	60
5. SMART Assistive Technology Goal Planner	61
6. Task Analysis Chart	62
7. Extended Assessment Summary	63
8. Voice Output Device Chart	90
9. Performance Data Chart	91
10. Task Observation Chart	93
11. Task Comparison Chart	94
12. Performance Data Chart	95
13. Classroom Observation Chart	97
14. Sample P3 Page	105
15. Sample of Paul's AT use	111
16. Sample of Tim's AT use	112

## List of Figures

1. Paul sample story	98
2. Tim sample story	100

## Chapter 1

### Introduction

*The success of technology has more to do with people than machines. All the right parts and pieces together won't work miracles by themselves. It is people who make technology powerful by creatively using it to fulfill their dreams (Alliance for Technology Access, 2000)*

Some individuals with disabilities become life long users of AT. If the individual has the access and support, AT can provide an enriching component to a persons' life. Consider the following example of Jim. Jim is a thirty four year old man with cerebral palsy. He has poor speech and has had limited mobility. He never had the opportunity to use technology aids until he was seventeen when he learned to read. His parents discovered he had a brilliant mind and he now holds a job as an accountant. He sees the devices he has had (from scooters to communication devices) as having opened up entirely new worlds for him, giving him access to new experiences, opportunities and independence he would otherwise not have had (Scherer, 2005). Although this case relates to all adults with special needs, it is relevant for readers to understand that the participants chosen for the present study will become adults with special needs facing these same issues in adult life.

The inclusion of technology in the lives of both individuals without disabilities and individuals with disabilities can be both a source of extreme frustration and extreme gratification to its users. If implemented effectively, technology can be an enriching component to enhance the mobility, communication and academic areas in the lives of people with disabilities. It can help a struggling reader become a better reader, it can

provide a voice for the non-speaker and it can give mobility to someone who is severely physically disabled. Technology, in essence, can provide valuable tools for life. If it is not implemented effectively, it can cause technology abandonment and frustration to its user.

On school inclusion,

*We have found through the children in our school they are very curious with lots of questions to start when someone with disabilities enters the school, but very shortly after the children treat them equally. Inclusion gives society a chance at the early stage of the children's lives to live with and understand the special needs in society. In some cases the children teach the adults not to fear communicating or socializing with special needs (mother of participant, personal communication, April 09, 2006)*

In the education system, one of the roles of the teacher is to provide the best possible environment for students to learn and to help students reach their potential. This becomes increasingly important when it comes to the diverse learning needs of students in our schools. Inclusion in the school system is a fundamental right of all students. Inclusion supports diversity, individual needs, reflective practice and collaboration (Salend, 2001).

All students with any type of disorder or impairment have the right to the same quality education as all other students. Schwier (1998) characterized schools as “communities that foster, encourage and promote relationships that reflect the community at large and where schools are a place where children and teachers create a community of learning” (Robyler & Schwier, 2003, p. 302, Schwier).

### *Background*

Assistive Technology (AT) is any item, piece of equipment, or product that is used to increase, maintain or improve the abilities of individuals with disabilities. The technology ranges from low-tech, low-cost items to high-tech, more expensive devices. (Reed, 2004). AT is fast becoming a highly recognized and important part of special needs programming for supporting inclusion in regular classrooms.

With the inception of the Individuals with Disabilities Education Act (IDEA) mandate in the United States in 1997 improvements and innovations have been made in the area of AT use and implementation for students with special needs. Because of this mandate, many states developed highly sophisticated AT systems currently in place. The US Department of Education funds such programs yearly, which in turn has vastly increased awareness and the value of having AT programs (Reed, 2004).

AT is a support system that allows a person with a disability to work around his or her area of challenge (Hopkins, 2004). The intent of using AT is to allow persons with disabilities to accomplish a task more independently and provide greater opportunities for learning.

Continued advancements in the field of computer technology have made it impossible to ignore the greater potential of using AT in the school system in Canada (Hopkins, 2004). In Canada the AT service falls under provincial responsibility, and provinces are left to develop their own AT programs. Consequently, some provinces have developed their own programs while others have not. Because there is no legislation in Canada mandating AT in schools, educators in some provinces are not aware of the benefits for inclusion using AT.

Difficulties such as lack of funding for AT and limited knowledge on the part of educators provide greater barriers in implementing AT in schools.

Under the policy framework for Children Services in Saskatchewan, each board of education is responsible for the provision and maintenance of AT within their schools, with grant recognition coming from Saskatchewan Learning. The Children Services policy (2002) states, “A board of education provides and maintains technical aids and equipment that allow access to education programs and instructional services for students with exceptional needs” (V.4.6). Strict guidelines stipulate that a student must be designated, which does not allow for the population of students that have learning disabilities or fall short of meeting designation status.

To counter the existing limited access and knowledge, it is important to raise awareness for AT and to provide a support structure for implementation. Evaluation and assessment are also critically important. Educators can profit from examining research to assess the impact of AT devices to make informed decisions and to enable them to develop or adapt existing frameworks for the implementation of AT.

### *Purpose of Study*

In this study I examined how two autistic brothers, one non-verbal, one higher functioning, made use of AT to enhance their communication needs. I showed how AT was used within the home, school, and community setting. I looked at how the inclusion of technology extends learning and provides greater access to learning, self-determination, and satisfaction to its users. The intent of this study was to show a snapshot of a school team and family with two special sons who required AT services. I

also investigated how the services were received and implemented, and I studied the challenges and successes that the children had with AT services in the school and home environments.

### *Research Questions*

For most students requiring intensive supports, the personal program plan that is completed at the beginning of the school year becomes their personal curriculum. I examined the existing personal program plan to determine the method of changing the existing plan to accommodate technology.

A prerequisite question I asked was whether technological competency should be treated as its own developmental domain or whether technology should be embedded into the established developmental domains. Once I determined the specific goals of the student I focused on these remaining questions:

1. How does the AT help facilitate the communication needs of the student with his peers? His teacher? His learning assistance teacher (special educator)? His teacher assistants and other staff?
2. How does the AT affect the pragmatic social application of communication and the communication competency of the student? What are the differences in the application and results?
3. What is the impact of having the carry over of the AT devices and applications/objective/goals to the students' home? Does it affect the way the students communicate with their parents? With the school?
4. What is the overall effect of using AT in the classroom? Does the use of

the device(s) help make the classroom environment more inclusive or less inclusive? Is inclusion dependent on the type and how it is used in the classroom?

### *Significance of the Study*

Perhaps one of the most important reasons behind doing this type of study was to provide special education and general education teachers' insights into how specific devices and strategies were implemented and their impact on the student. It is impossible for any single educator to have first hand knowledge of every kind of AT device and its effect on the student.

As we do not currently have an equipment loan repository where equipment can be borrowed, we need to rely on studies such as this to consider what works in context to allow educators, parents and users to make reasonable choices. It is expensive for school divisions to purchase technical aides, which sometimes prove to be ineffective for the students.

Many students with diverse needs rely on AT that ranges from low to high tech, in order to help them function in a school environment. This study may provide useful information for those educators working with students who require or want to learn more about assistive technologies.

The study is also significant because it examines a context in which little AT had been previously used to support inclusion in the classroom. Neither had it been used extensively in the home environment. I conducted the study over a period of approximately seven months, in which AT was implemented, taught to participants and observed in the school and home environment. In this study I attempted to show how



inclusion of technology might increase success of the users at school; and I also attempted to how important it was to have a strong home/school connection. With a strong connection, the value of what was learned at school was transferred to the home, thus creating greater internalization and the possibility for generalization of skills.

I conducted this study at a time when Saskatchewan Learning is embarking on a pilot project in AT policy and procedures. During this pilot, school divisions will be asked to set up their own AT implementation process, using Saskatchewan Learning guidelines and to report back on the implementation.

### *Definitions*

The following definitions apply to this study:

*Augmentative and alternate communication (AAC):* A communication approach that augments or provides alternatives to natural speech or writing for persons with severe communication disorders (American Speech and Language Association, 2005).

*Assistive technology device:* Any item, equipment, or product system, whether bought, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of an individual with a disability (Reed, 2004).

*Assistive technology service:* Any service that directly assists an individual with a disability to select, acquire, or use an assistive technology device (Reed, 2004).

*Autism:* A pervasive developmental disorder, which is characterized by impairments in communication and social interaction and restricted, repetitive and stereotypic patterns of behaviour, interests, and activities (Saskatchewan Learning, 1994). It is a complex neurological disorder that affects the functioning of the brain.

*Communication:* The exchange of ideas, information, thoughts and feelings between people.

*Communication Board:* A low technology communication device that displays symbols, pictures, or text to convey messages and meaning.

*Designated student/student with special needs:* A term used to describe students who have a disability falling under established criteria allowing special funding from the government to support their needs.

*Disability:* A physical or mental impairment that limits one or more of the major life activities of an individual; a record of such an impairment or being regarded as having such an impairment (Alliance for Technology Access, 2004).

*Functional Communication:* Communication that involves behaviour directed to another person who provides related, direct or social rewards in return to another person.

*The Individuals with Disabilities Education Act (IDEA):* The IDEA mandates that a free and appropriate education be provided to all students with disabilities, regardless of the nature and severity of their disability (Reed, 2004).

*Inclusion:* Seeks to establish collaborative, supportive, and nurturing communities of learners that are based on giving all students the services and accommodations they need to learn, as well as respecting and learning from each other's individual differences (Salend, 2001).

*Learning Assistance Teacher/Special Education Teacher/Special Educator:* A role given to a teacher who specializes in programming and support for students with disabilities in the school system.

*Picture Exchange Communication System (PECS)*: An augmentative system for teaching functional communication skills and potentially providing a bridge to speech acquisition (Bondy & Frost, 2002).

*Pervasive Development Disorder (PDD)*: A group of conditions that involve delays in the development of many basic skills mostly in communication and socialization. The five types are Autism, Asperger's Syndrome, Childhood disintegrative disorder, Rett's syndrome and Pervasive development disorder not otherwise specified (PDDNOS) (Saskatchewan Learning, 1999).

*Personal Program Plan (P3)/Individual Education Plan (IEP)*: These terms will be used interchangeably throughout this document. It is a living document provided to every designated student (one who meets the requirement of a disability), which changes as the goals of the student change. It provides an outline of the student's individualized program and a framework for collaborative planning with parents and teacher (Greater Catholic School Division, 2002).

### *Delimitations*

This study involves only two participants. I made a deliberate decision to allow close observation and engagement with the participants. Having only two participants restricts generalization of the results.

Another delimitation of this study was that I, as a researcher, was also the special education teacher responsible for planning and administering the personal program plans of both students. Because of my dual role of the researcher, my role may be considered dependent for both the participants and their family. It is not the intent to obscure places

where I, in my dual role may have influenced an outcome.

### *Limitations*

Through a donation from Hewlett-Packard Canada, the special education team received a laptop, pocket computers, a digital camera and digital projector. This equipment was provided to me to use at my discretion for my special education programming. Through the Saskatchewan Learning technology aid grant program, software programs were obtained to fit with hardware received from HP Canada. Therefore, some but not all technology was pre-determined before the start of the study. This is a limitation because some of the AT was assigned instead of allowing the team to determine what the best technology options may have been for the students. The results were restricted to contexts employing similarly assigned technologies, not to contexts in which the needs of learners determined what technologies were employed.

There is a process that educators can use before they get to the point of implementation, which is clearly outlined in the framework used. Important to note, however, is that there were things that happened naturally during the evolution of the study that influenced the research; strategies were discarded, revised or changed and expanded when the initial strategies were not working.

## Chapter Two

### Review of Related Literature

#### *Introduction*

Although AT has been in the schools to support students with disabilities for the past twenty years, it was not until the mid 1990s that AT became an important and independent feature of support for students with disabilities. Over the past decade, AT such as personal computers, communication devices, switches, specialized keyboards, and other assistive devices and services have influenced teaching. Thorkildsen (2006), stated, *“Without AT, children who cannot verbally communicate are denied many social and learning opportunities inherent in a formal education. With limited mobility, children may be unable to attend school”* (para 6).

The following scenario describes two individuals in different decades and the advances that occurred. Both Jim and Jeremiah have cerebral palsy. When Jim was born in the 1950s, his parents were told to institutionalize him. He did not learn to read till he was seventeen when he received his first assistive device. Jeremiah was born in the 1980s. He received his first computerized communication device and wheelchair at age nine. At sixteen he had presented a speech on technology to the governor of his state (Scherer, 2005).

In 1998 The Technology Related Assistance for Individuals with Disabilities Act or IDEA was passed in the United States, which mandated that every school district provide AT for their students with disabilities (Reed, 2004).

School divisions in Canada, though not mandated by government policy, over the past few years have created or adapted from existing frameworks their own AT

implementation plans.

In Saskatchewan, technical aide grants have been provided through Saskatchewan Learning to help school divisions acquire technology support for students with special needs which promote student participation (Saskatchewan Learning, 2002).

Research in AT suggests strongly:

*“that the appropriate application for AT may be one of the greatest equalizing forces in the education and meaningful inclusion of students with disabilities both in terms of promoting access to the general curriculum and in facilitating the ability of students to demonstrate mastery of that knowledge” (Michaels & McDermott, 2006, para 1)*

### *Organization of Literature*

In this review of the literature, I focused on understanding the conditions of the participants and the strategies that were used to support them in their daily lives. Next, I review the programming relevant to the students, and finally I review the AT process from the planning to the assessment phases.

### *Autism*

The Saskatchewan Learning document on Autism (1999) classified autism as a pervasive developmental disorder (PDD), which is an umbrella term for disorders that involve impairments in reciprocal social interaction skills, communication skills, and the presence of stereotyped behaviors, interests, and activities. The conditions classified as PDD are:

- Autism
- Childhood disintegrative disorder (CDD)
- Rett’s Disorder

- Asperger's disorder
- Pervasive Developmental disorder not otherwise specified (PDD-NOS)

Several different terms attempt to explain what autism is and what it is not. In her book, *"You're going to love this kid"* author Paula Kluth (2003) stated that the most important definitions come from the people with autism:

*Autism isn't something a person has, or a "shell" that a person is trapped inside. There's no normal child hidden behind the autism. Autism is a way of being. It is pervasive: It colors every experience, every sensation, perception, thought, emotion, and encounter, every aspect of existence. It is not possible to separate the autism from the person-and if it were possible; the person you'd have left would not be the same person you started with (p. 2).*

Autism is a pervasive developmental disorder, which is characterized by impairments in communication and social interaction. It is a complex neurological disorder that affects the functioning of the brain. It is estimated that one third to one half of children and adults with autism do not use speech functionally (Saskatchewan Learning, 1999).

Many students with autism seem unaware of their surroundings and others' attempts to communicate with them. Some do not use speech and may not even attempt to communicate with gestures. Others learn to speak but their speech may be echolalia (imitative) or they may not know how to use their speech to communicate their wants and needs. What causes autism is questionable; there are theories that range from genetic disorders to environmental factors to biological differences in brain functioning.

The main features of autism are impaired social interactions, impaired verbal and nonverbal communication and restricted and repetitive patterns of behavior. Many

autistic people do not like routines disrupted, and are sensitive to noise and touch. Their communication is affected and they may have some degree of difficulty in social interactions with others such as social reciprocity and understanding social norms and behaviors.

Symptoms can be present in a variety of combinations and can range from mild to severe. Some individuals have normal and others have severe levels of intelligence. Typically, students face problems with attention and social interaction. They are often resistant to change and respond differently to sensory stimuli, often needing to have various forms of sensory integration to regulate their body such as wearing a weighted vest.

There are usually a range of difficulties in expressive and receptive language and communication. Some experience great difficulties in oral language, having unintelligible speech, using repetitive or imitative speech, or restricted vocabulary (Saskatchewan Learning, 1999).

Many different strategies are used to help support individuals with autism cope with daily life. The use of visual schedules presents concept of time in more concrete form, and allow students to anticipate upcoming events and activities. These schedules help in many ways including having the ability to predict change, stimulate conversation, increase on task behavior, set limits for behavior (first this, and then this), and provides a structured, predictable environment. Higher functioning students may experience difficulty with pragmatics of conversation, have difficulty understanding social situations or the perspective of others. Often communication interventions and supports are needed. Teaching social skills provides meaningful contact with peers, uses visual representation,



teaches key social rules, and provides self-monitoring skills in the student (Saskatchewan Learning, 1999).

### *Communication*

*“Personal achievement in life is a function of the ability to communicate”  
(American Speech and Language Association, 2005).*

Communication is a basic need and individual right of all human beings. The purposes of communication are to exchange information, to make requests, and to socialize and interact with others. These interactions are an essential part of our society and culture. Expressive communication includes a variety of modes, such as speech, pointing, gestures, and writing (Set-BC, 2000).

Use of a visual system that utilizes pictures or words can serve as a new way to convey information and augment verbal instruction, which make it accessible for students with autism (Bondy & Frost, 2002).

The use of visual supports such as icons, photos, and text can be very useful for communicating a number of expectations in the classroom around routines, agendas, behaviors, and transitions, and daily schedules. Certain characteristics of autism demonstrate a huge impediment to expressive communication. Lack of functional speech, interest in interaction, poor eye contact, lack of social reciprocity, and cognitive deficits make it very hard to teach expressive communication. It is important for educators to understand the lack of function in the expressive communication of the student. Asking questions such as “What does my student need to communicate and with whom?” and “How will my student communicate?” are a few starting points to figure out

how the school can help the student. Functional expressive communication behaviors include gaining attention, requesting, greeting, and responding (Stokes, 1996-2006).

The use of special symbols can signify special activities in the class routine and a sentence strip can be provided to show an outline of the student's day. Various studies suggest that students can learn to use pictorial or written schedules for independent self-management, and in some cases, their problem behaviors may be reduced when these supports are provided (Mirenda, 2001). Through personal experience as a special educator, using schedules provides structure to a students' day because it allows the student to see what is happening and forewarns him/her of any changes that may occur during the day.

### *Social Communication*

Social communication is thought of in terms of pragmatic social skills or "in-practice" communication and provides us with the ability to have reciprocal social interaction with others (Moyers, 2001). Symptoms of autistic individuals include difficulty with turn taking in conversation. They are also very literal in their understanding of spoken language. There are no gray areas, black is black, white is white, rules are rules. However, exceptions to rules are very difficult to understand. For example, lying is wrong, but white lies are acceptable. A child with autism may hear someone such as his or her parent say a white lie such as he is too busy to talk. The child with autism does not understand this, as the parent is not busy.

Individuals with autism may lack voice inflection in conversation and their speech is monotone. They have difficulty in recognizing the use of irony or figures of speech in

conversation (idioms), in using social etiquette skills such as having difficulty with sarcasm, and in being too blunt with their friends and peers and adults. These are all symptoms of social communication problems (Moyers, 2001).

### *Social Behaviour*

Social behavior can sometimes be referred to as the ability to “step into another person’s shoes”, or to show empathy. A classic symptom of autism is having a weakness in perspective-taking ability. This may lead to not being able to offer comfort or to accept comfort from others. There can be problems with individuals displaying imitation skills, using pretend play, and reading non-verbal gestures and cues.

There may also be difficulty in the ability to practice self-awareness, for example, not understanding why clothes need to be matched. A typical symptom is the lack of eye contact when being around other people in social situations and conversations, although many individuals with autism have been taught to maintain eye contact for longer periods of time (Moyers, 2001).

### *Communicative Competence*

Communicative competence is the ability to communicate functionally in the natural environment and to adequately meet daily communication needs. According to Light (1989), linguistic skills include receptive and expressive abilities in the language spoken. Operational skills refer to the technical skills required to use the augmentative and alternative communication (AAC) system effectively. Social skills refer to

knowledge, judgment, and skills in the social linguistic rules of interaction. Strategic skills are compensatory strategies used to overcome communication and technology breakdowns (Ball, Bilyeu, Prentice, & Beukelman, 2006).

In order to teach communication skills, as in interactions with fellow students, the use of a general instructional model created by Light and Binger, can be applied which is often used in special education for a variety of instructional purposes (Light & Binger, 1998). In this model, the following steps are used:

1. clarify the goal
2. select the vocabulary and means of multimodal process
3. select the method (i.e. communication board, computer, gestures, etc.)
4. teach the facilitators strategies that support the individual who uses AAC  
in learning the target skill
5. teach the target skill to the AAC user (for example, through a social story),
6. check for generalizations
7. evaluate outcomes
8. complete maintenance checks.

The instructional procedures used by Light and Binger have proven successful in teaching AAC users new skills and strategies. The features in the instruction are first describing the skill to the learner, and then modeling the use of the skill. Next the instructor describes the rationale for the skill and discusses with learners situations where the skill will be used. The instructor must provide guided practice for the learner in the use of the skill and provide feedback on the learner's performance. When learning a new task, many opportunities need to be provided to allow the user to practice skills and the

instructor must continue to practice the skill with the learner until he/she can use the skill proficiently. For effective learning the instructor should start instruction with simple tasks and situations and then progress to more difficult situations. Generalization of the skill will happen by varying the types of materials used in practice.

Light and Binger found these instructional features excellent in teaching three different skills (a) use of an introduction strategy when meeting new people, (b) use of partner-focused questions in social interactions, (c) use of nonobligatory turns to increase participation in social interactions (Light & Binger, 1998).

These skills are essential in building turn taking skills when people participate in social interactions. Many non-verbal individuals do not understand the social reciprocity of conversation. Using these strategies helps the individual learn these skills. This model can be used to teach students many different skills.

### *Pragmatics*

Pragmatics is the study of how language is used to communicate within its situation context. Three types of pragmatic competence are: (a) knowing how to use language forms and structures, (b) knowing how to use information from the social context to determine what to say and (c) knowing the rules for engaging in social exchanges or conversational abilities. Critical to this process is the ability to initiate, maintain, and terminate conversations (McCormick, Loeb, & Schiefelbusch, 2003).

Communication is the exchange of ideas, information, thoughts and feelings. It is determined by the degree individuals find acceptance from their peers during social interaction. When determining social skills programming, not only must one consider

social skill acquisition (teaching the appropriate skill), but social skill performance (level of performance in a given situation) and the generalization of the skill from one situation to another must also be considered (Dobrowolski, 2006).

### *Personal Exchange Communication System (PECS)*

PECS (Bondy & Frost, 2002) was developed in 1985 in response to the difficulty in successfully using a variety of communication training programs with young students with autism. The PECS training protocol is based on the principles of applied behavior analysis. Distinct teaching strategies, reinforcement strategies, error correction strategies, and generalization strategies are essential to use to teach each skill in the program (Bondy & Frost, 2002).

Skill levels develop in stages. There are six phases as well as additional communication skills. Knowing these phases is critical in understanding the phase where the learner is at in his level of communication.

Phase 1 – initiating communication with someone with a picture of an item

Phase 2 - expanding the use of picture by creating distance with the partner

Phase 3 – choosing the message in PECS by selecting an item to request

Phase 4 – introducing the sentence structure by placing “I want” on the sentence strip

Phase 5 – teaching answering simple questions by responding to “What do you want?”

Phase 6 – teaching commenting - student answers, “what do you want?”

Additional critical communication skills taught focus on requesting, following a schedule, learning how to wait for something, and requesting a break (Bondy & Frost, 2002).

### *Augmentative and Alternative Communication (AAC)*

ASHA defines AAC as “*an area of clinical practice that attempts to compensate either temporarily or permanently for the impairment and disability patterns of individuals with severe expressive communication disorders*” (Ball et al., 2006, p.423).

The term AAC is used to describe expressive communication methods other than verbal speech, for example, sign language, gestures and alphabet or picture systems (Set-BC, 2000). Many individuals who are diagnosed with having autism often require some type of communication method to express themselves depending on the severity of the disorder.

The goal of AAC in school is to maximize a student’s potential in academic, social-emotional, and vocational pursuits by enabling functional communication (Ball, et al., 2006). The AAC device used provides a voice for the student to participate in modified academic activities, interact with members of the class individually or in groups, giving the AAC user a degree of independence he/she may not otherwise have had.

Implementing AAC is a complex process that requires a team effort. The teacher and special education teacher role are critical for modifying curriculum, documenting, creating goals, and setting up equipment. Just as critical is the teacher assistant role. He/she can provide valuable insight in the student as perception of the device, how others view the device, perception of the AAC user, and the level of difficulty or ease the student has with the device and the progress the student is making. Teacher assistants spend the majority of time with the student helping with the device. They have a unique challenge of providing support for the student in the classroom, while at the same time

ensuring opportunities for increased independence (Ball et al., 2006).

Sometimes, even though a student uses an AAC system, they may be only using it to answer “yes”/ “no” questions or gesturing and labeling. This shows that the student is not initiating communication or communicating with a variety of vocabulary. It is important to consider using the system for more than requesting behaviors or responding to their wants and needs. It is important to engage students in language-rich environments throughout the day (Casey & Kornfeld, 2004). While using single message devices help the AAC user foster participation in an immediate activity, it does not support vocabulary development needed for building communication competence. Children also need language opportunities in reading and vocabulary development and communication systems that support them. Therefore, both high-tech and low-tech devices prove useful in supporting activities across the system. Although the PECS system is valuable in expressing the needs and wants of the student, other ways must be developed to increase vocabulary, sentence structure, and reading.

Curriculum activities likely need to be modified; therefore, consideration should be given when a specific curriculum is being used. Emphasis needs to be placed on the student’s communication by incorporating AAC within classroom interactions because students who use AAC often have impaired language systems, limited literacy skill practice, and underestimated literacy learning potential. (Ball et al., 2006).

Literacy intervention can be divided into two categories. The first is physical access to literacy, which means making the necessary accommodations of the student to manipulate and have access to literacy materials such as scanning a book, messaging, etc. The other intervention for students who use AAC involves cognitive access to literacy.



For example, rewriting the text to a book that contains vocabulary the student understands and using picture symbols to accompany text to allow for independent reading, talking word processor use and creating picture dictionaries (Ball, et al., 2006).

Graphic symbols such as PECS provide AAC users with a way to learn and understand the world around them. Not only can they use they symbols as a primary form of communication, they can also use them in literacy development (Beukelman & Mirenda, 1998).

Word knowledge plays a key role in learning and understanding text so it makes sense that the greater their vocabulary, the greater the level of comprehension. Based on this foundation, a natural progression would be to transfer skill knowledge of the symbols and use them to help the student learn that print conveys meaning. Inserting symbols with text teaches the directionality of print, and that letters represent sounds.

There is some question as to whether AAC users can learn to read words without their associated symbols by pairing words with and without their related word. It is hard for them to learn words out of context and they do not learn to discriminate individual letters through paired associative learning. AAC users whose literacy exposure may be limited to graphic symbol-work associations must have exposure to activities that teach letter-phoneme associations and facilitate speech-to-print matching (Beukelman & Mirenda, 1998).

In order to provide greater access to classroom experiences, computer-supported reading allow students to choose text which has speech output that can read words, lines, letters. Some programs allow the word being typed to be spoken as it is typed. A talking word processor highlights text as the device speaks it aloud. Students can also use

talking word processors as reading and speaking tools to participate in oral reports with their classmates (Beukelman & Mirenda, 1998).

When speech is used with standard and special augmentative communication, not only does communication increase, but also social interactions, school performance, feelings of self-worth, and job opportunities (American Speech and Language Association, 2005).

### *Social Participation*

In a case study conducted by Howley, (2001), stated, *“While it can be relatively easy to teach ‘splinter’ social skills, considerable challenges are presented in the development of social interaction within a broader context”*(p.89)

Students need to have a large degree of social competence both socially and academically. Social competence depends on an ability to draw upon a range of strategies in an integrated way, as opposed to developing isolated skills. Students need to use social judgment to apply and generalize learned social skills appropriately (Rose & Grosvenor, 2001).

*Tim says he feels different only when it comes to rules. There was one time when he was struggling with homework he told his dad and me that we wouldn’t last a day inside his head-as he can’t remember or understand sometimes (mother of participant, personal communication, Feb. 2006)*

### *Social Stories*

Gray (1998) stated, *“the goal of a social story is to share relevant information. This information includes (but is not limited to) where and when a situation takes place,*

*who is involved, what is occurring, and why” (p.171).*

Social stories provide a structure to teach a social skill and utilize a visual medium, which can be used in different environments. One must put careful thought into writing a social story as it may not be able to address exceptions to the rules of social behavior (Moyers, 2001).

Gray described social stories as a process and product. The process is when the person making the story considers the situation from the autistic students’ point of view and writes the situation that becomes the product (Gray, 1998).

The story includes five types of sentences. They include a descriptive sentence or statement of fact; a perspective sentence describing other people’s thoughts; and affirmative sentence with expresses shared values and a directive sentence, which identifies suggested or recommended responses. There can be more than one of the last three types of sentences in a social story. Sometimes these stories are also created with pictures to provide visual stimulation.

The use of social stories can increase awareness of the what, when, who, and why of social situations. Social stories can be implemented in multiple settings combined with various methods to achieve improved social functioning (Gray, 2000).

Social stories are broadly used by special educators to do many things such as pre-teach a behavior, prepare an autistic child for an upcoming event the next day which causes a break in his routine, teach a situation, teach a procedure, etc. The purpose of social story intervention is to achieve long-standing change using revised social stories or other supports to prompt appropriate behavior (Gray, 2000). In a behavior situation, complete fading may not be possible, however, in teaching a routine, complete fading has

occurred. There is no empirical research that suggests social stories alone will cause a positive change in the behavior of the student. However, educators should keep them content specific when they can. Stories should explain the context of the social situation; target the behavior and the responses of others.

### *Comic Strip Conversations*

*“Comic strip conversations work for Tim because he has to tell his story and then he takes ownership of it. It helps him remember the next time he is in a similar situation” (teacher assistant, personal communication, April 14, 2006).*

A comic strip conversation is a pictorial conversation between two or more people. This strategy employs the use of simple drawings, which serve to illustrate an ongoing communication between two or more individuals. Having students create these conversations provides additional support for individuals who struggle to comprehend the quick exchange of information that occurs in a conversation (Gray, 1994).

Comic strip conversations provide a tool for students to illustrate social skills that are abstract and difficult for students to understand. They are specific because they illustrate what people say and do, and emphasize what people may be thinking. They are used to visually “work through” a problem situation and identify solutions. They also allow the person to draw as they talk. There is a conversation symbols dictionary that shows students how to draw people listening or interrupting and to convey loud and soft talk and thoughts (Gray, 1994).

Unique to this process is the ability of an assistant who helps prompt the student so he understands the situation clearer. The assistant asks pointed questions such as “Where are you?” “Why did you do that?” and “Why were you thinking when you said

that?” The conversation is then summarized so the student can identify solutions to the situation. Social comic strips provide visual learning to the student and learning is also broken down into chunks due to writing information in boxes. The strips can be stored in a book and provide steps to a social situation, which can be memorized (Gray, 1994).

### *Social Reciprocity*

In the give and take of social language, social standards are sometimes fraught with inconsistencies. James Williams, a 17 year old with high functioning autism, commented on his website that in order to grasp higher social learning, for example, always telling the truth does not mean that you use literal language when speaking. For example, children are told to always tell the truth. However, most people understand that you should not say to someone “you are fat” even though the person is fat (Williams, 2006). Social reciprocity can only work when a child is ready and interested in learning social interaction. James gives an example of how sometimes a child should be allowed to practice social interaction without being corrected. Williams stated:

*It's not that I don't want to share or listen to someone else or make someone feel good by being nice and polite to him. I know about all those things. It's just that people are impatient and intolerant and impolite to me all the time, and they force me to-do things that I'm not interested in just to fit in, but when it's my turn to talk about things like road maps and train schedules, I'm told that I'm boring them and that it's inappropriate and that I don't know how to interact with my peers. No one seems to make the effort to learn to interact with me, but I'm always expected to make the effort to interact with them (pt. 5, cooperation and reciprocity).*

### *Programming*

Programming is essential to meet the students' needs. Programming involves the school team, usually made up of the teacher, parents, learning assistance teacher, teacher assistants, sometimes outside agencies, and sometimes the student.

### *Personal Program Plan (P3)*

The purpose of the P3 meeting is to discuss a student's unique needs and plan a program of intervention that will meet those needs (Reed & Bowser, 2006). The P3 forms the basis of the student's educational program.

Saskatchewan Education suggested that a P3 be developed through collaboration by a team of people directly involved with the student. The team includes the parents, classroom teacher, special educator, teacher assistants, speech language pathologist, consultant, and education psychologist and the student where appropriate.

The P3 is intended to guide the day-to-day work of the educators and to provide information on the types of adaptations and strategies used to accommodate the student. It provides an outline of the curricular goals of the student, the types of adaptations and effective strategies used with the student. Contents of the P3 include personal and educational data of the student including assessment information, student strengths and weaknesses, long-term goals, and short-term objectives.

Key domains are communication, developmental (expressive skills, receptive language and pragmatic skills) academic instruction, environmental factors, social skills, self-control, and self-management. Goals are discussed and decided for some or all domains with the team members. Resources and strategies, which are used in working

toward the goals, are recorded as well as the assignment of responsibility for carrying out specific aspects of plan. Review dates and evaluation procedure are also decided at the P3 meetings (Saskatchewan Learning, 2002). Establishment of the P3 involves five steps:

1. Setting direction by establishing a team and clarifying responsibilities.
2. Gathering and sharing information through reviewing records and reports, consulting parents, previous teachers, conducting further assessment and sharing information.
3. Planning of the P3 meeting to develop a personal curriculum and the desired outcomes, skills to be learned, and how and where instruction will take place.
4. Writing the P3 with the essential components, which include prioritizing needs by domain, identifying student annual goals and performance objectives. When the P3 is written the parents review and approve it.
5. The final step is to implement and evaluate the P3 by establishing a daily plan to put the plan into practice with regular review and revisions. The P3 is evaluated at the end of the year to formalize learned goals and objectives and plans for transition.

### *SMART Goals*

SMART is an acronym for a specific type of student outcome. It is used as a guide to aide in planning goals, in this case, for student goal setting.

*S – specific* (clear language)

*M – measurable* – allows student achievement to be described, assessed and evaluated

A – *achievable* – realistic for the student

R – *relevant* – meaningful for the student

T – *time related* – can be accomplished within a specific time period.

Annual student outcomes are concise descriptors of what an individual student will know and be able to do by the end of the school year. Short-term objectives are the tasks, steps, and environments that enable the student to achieve the goal. The purpose of goals is to improve programming, to inform decision-making, and to provide accountability. To write a SMART goal for P3 purposes, educators look at the domain of learning and the current level of performance when creating student outcomes. A SMART goal will look like:

*(Student) will (action) (what/how) (by what criteria) (where) (by what date).*

The attainment of the goal is measured by the extent to which an individual has met the expected outcomes, and it provides a way to evaluate the student outcomes from the P3 (Saskatchewan Learning, 2005a).

### *AT Pilot Project*

Saskatchewan Learning recently created a document entitled, *AT Policy and Practices* in order to define AT principles and best practices in the province. In an attempt to refine the process towards allocating AT in Saskatchewan, Saskatchewan Learning developed a pilot in which school divisions can review the qualifications for AT funding, implement the principles, and use the information provided by Saskatchewan Learning when requesting AT equipment. The document allows school divisions to review and apply the principles. The recorded observations of school divisions involved



in the pilot project will be forwarded to Saskatchewan Learning to refine the AT process.

The purpose of this pilot is to bring consistency, clarity, and transparency within the process of the selection/approval of technical supports for students with designated disabilities in order to access their educational programming (Saskatchewan Learning, 2005).

The following summary set out the principles and guidelines for this pilot.

*Principles:* AT has a specific purpose and function in the student's program. School divisions require knowledge of AT devices and the ability to integrate technology into educational programs. The AT process involves not only requesting AT devices and receiving them, and it also requires ongoing monitoring and reassessing to ensure AT is promoting student progress. Consideration must be given to the time to teach the student and staff in using and caring for the device and to plan for time it takes to train how to use it. The long-term application for the student, which includes any changes needed, requires equal consideration.

*Guidelines:* AT implementation should include the following considerations: a) the impact of the student's disability in the classroom environment, b) the student's academic ability and maturity, c) the level is matched to application and management of equipment and, d) the allocated AT must have an outcome measure (Saskatchewan Learning, 2005b).

Saskatchewan Learning provides grant recognition for approved technical aides. As mentioned in the introduction, the Saskatchewan Education Policy states that a board of education provides and maintains technical aids and equipment that allow access to education programs and instructional services for students with exceptional needs.

Technology equipment is provided for a student with a designated disability in order to access curricula. Access to curricula simply means giving the student an alternative way to learn the curriculum, such as a deaf and hard of hearing student who requires an FM system in order to listen to the teacher's instruction.

### *Importance of Home/School Connection*

Kluth (2003) offers a parent insight on the importance of maintaining a strong home and school connection in the following statement:

*Somehow, somewhere, an invisible barrier has been built between school and home. We all need to realize how much we both are an integral part of our children's education. What is done at home impacts what is done at school. Student progress would soar if we could all be on the same page (p 58).*

For AT to be functional, students must be able to have access to the devices and strategies at home and at school. Families need to be provided with appropriate training to use the device(s) in the home environment. If a technology device is to be successfully adopted in the home, schools must be sensitive to parents' unique goals and expectations.

When AT is included in the IEP/P3 program, the school team needs to spend time with the family; informing them what questions they should be asking. Questions such as: What part they need to play in the programming decisions, Why a device may be needed, How it may help their child, and How they can best support their child with the device are all important to clarify. Teams also need to provide adequate training, ongoing evaluation, and follow-up with parents for the AT to work for the student. Tincani & Boutot (2006), offer the following guidelines that may increase family acceptance to AT devices. They include:

1. making curriculum relevant to the individual child, family, peers and community
2. to utilize parents as full partners for educational planning and decision making
3. good communication with family and professional
4. Incorporating the child's skill development into the family's typical daily routines.

School professionals must also be aware that their perception of what is right for the child may not be the perception of the parents. Sometimes, parents are accused of being too involved or not involved enough in the child's education. They may feel left out because they are unaware of procedures or the programming, or they may be viewed as not placing as high of a need on education as the professional because they feel there other issues that need to be dealt with. This does not mean that their perception is wrong. Both parties need to recognize the individual needs and talents of the exceptional child they are working with and recognize the difference of opinions (Tincani & Boutot, 2006).

### *Assistive Technology*

King (1999) emphasizes a more human factor compared to the governmental definition of AT. Ashton (2006) cites King's definition of AT as:

*Assistive means helping, supporting, and aiding in accomplishing practical functions, tasks, or purposes for persons of all ages. Individuals who use AT may include anyone. These persons may have a variety of special needs, disabilities, limitations, and/or challenges that limit their*

*participation in life and thus require supportive functions from other humans and for special tools and devices.*

*Technology means reliance on simple as well as potentially highly complex tools, devices, and equipment, and on related industrial processes, which may be mechanical, electronic, electromechanical, or hydraulic in nature (or combinations of these features) as well as the strategies, methods, and techniques that the human must bring to the interaction to make tools and devices operate to accomplish a purpose (p. 230)*

AT is characterized by low tech, mid tech; and high tech. Table 1 shows a sample continuum example of each type. Many AT solutions are not high tech solutions. The DESK Manual (Reed, 2003) offers many ways in which low cost technology aids can be incorporated to support daily learning for students. Most low-tech devices are relatively inexpensive, such as a fifteen-dollar recording key chain device. High tech solutions such as computerized systems with special software programs can cost thousands of dollars.

There are a multitude of devices available, which makes the task of finding a device to suit the needs of the user a daunting task. If the appropriate device is chosen, it can improve a student's academic and social experiences by compensating for, and/or increasing the student's abilities (Thorkildsen, 2006).

Table 1

*Sample Continuum of Assistive Technology*

Low-Tech
<ul style="list-style-type: none"> <li>• raised line paper</li> <li>• alternative writing surfaces (whiteboards, etc.)</li> <li>• alternative writing implements (magnetic letters, alphabet stamps, etc)</li> <li>• materials to support memory, focus and organization (sticky notes, highlighters, webs, work systems like colour coded file folders</li> <li>• picture communication boards, picture schedules, file folder activities with symbols, activity schedules, calendars, sequence cards, etc.</li> </ul>
Mid-Tech
<ul style="list-style-type: none"> <li>• tape recorders; audio books</li> <li>• talking calculators and/or spell checkers</li> <li>• dedicated word processors</li> <li>• simple voice playback devices such as talking picture frames</li> <li>• single switch devices like the Step by Step Communicator</li> <li>• visual systems like picture cards placed on voice output communication devices</li> </ul>
High-Tech
<ul style="list-style-type: none"> <li>• video taping</li> <li>• advanced voice output communication aides that offer multiple levels and dynamic display</li> <li>• specialized software such as: talking word processors, word prediction software, screen reading software, scan-and-read software</li> <li>• dedicated communication devices</li> <li>• specialized computer access such as; touch screens, alternative keyboards</li> </ul>

Note. Adapted from: (Reed & Lahm, 2004) and (Alberta Education, 2006).

In order for AT to be successful, a well developed AT framework must be used to implement the AT within the school structure. Some guiding principles that should be incorporated into the AT framework used is cited by Zabala (2006.).

1. The primary goal of AT is the enhancement of capacities and removal of barriers to performance.
2. AT can be a barrier (consider the barriers – all the things that can go wrong).

3. AT may be applicable to all disability groups and in all phases of education.
4. AT is related to function, not disability.
5. The least complex needed to remove barriers to performance.
6. Assessment and intervention form a continuous, dynamic process.
7. Systematic problem analysis and problem solving are essential.
8. Follow-up and adjustments are expected.
9. AT does not eliminate the need for teaching social and academic skills.
10. A team approach is required.

Quality Indicators for AT services in schools is a set of descriptors of critical elements related to major functions involved in the provision of AT services. They were developed by a team of professionals and include six functions: (a) administrative support, (b) consideration of need, (c) assessment of need, (d) documentation in the P3, (e) implementation and (f) evaluation of effectiveness. They were developed to provide school systems support in the development, delivery and evaluation of AT services provided (Zabala, 2006).

In a study by Todis and Walker (1993), the authors found that devices tended to be underutilized for the educational goals for which they were intended. They concluded that the most pervasive barrier was a lack of understanding of the interaction of the different factors that influence effective use of AT. These include all aspects of AT, from service providers to planning to school personnel and families. The perspectives, attitudes, knowledge, and skill of the AT and its users; the different views on the goals

and the lack of collaboration within the team were also barriers to AT use.

In other words, lowering barriers and increasing the consistency of quality AT service delivery requires: a) addressing differing perspective, attitudes, knowledge, skills and levels of preparedness of the many people who play a role in the consideration, development and delivery and evaluation b) increase opportunities for school staff and family member of students with disabilities to learn about and participate in AT processes and c) providing a systematic guide for planning, developing, and delivering AT services and devices (Zabala, 2006). A complete list of these quality indicators can be found at the website listed in appendix D.

### *AT and the P3*

The IDEA '97 requires that each IEP team in the United States include any AT devices or services the student requires, as well as any training any team members need. AT can be included as part of the goals and objectives, related services, or supplementary aids and services (Reed & Bowser, 2006).

Significant to this case study was the process of infusing AT into the personal program plan used at the school. A partial goal relevant to this study was to determine which part of the P3 could be adapted to allow AT infusion in the P3 process. With respect to the implementation of SMART goals initiated by Saskatchewan Learning which are now to be an integral part of the P3 process, it made sense to include AT in the goals and objectives of the P3 and to develop SMART goals for them.

When considering developing an IEP/P3, which includes AT, the following list from Zabala & Carl (2006), was consulted:

1. Develop measurable goals and objectives.
2. Base goal and objectives on the general curriculum first.
3. Focus on student performance outcomes.
4. Consider what are the instructional tasks of the student, what barriers exist in accomplishing the task, how does the AT help overcome these barriers and what is the range of supports provided to the student to overcome the barriers?
5. Write collaborative integrated goals.
6. Write curriculum-based objectives.
7. Use generic terminology for focusing on AT features.
8. Include a system of AT devices to use.
9. Be specific as to the role of AT.
10. Inclusive AT services and program supports.

### *Implementation*

School divisions in Canada differ from the US in terms of AT implementation in terms of the availability of an AT consultant available in the school system. When I was reviewing the frameworks to implementation process, most included an AT specialist who is brought in to help the school team decide on the best device to use and to provide training.

From experience in my own division and knowledge of other school divisions in Saskatchewan, I observed that AT specialists are not common, although in some provinces there are AT specialists. Reed and Bowser (2006) suggested that “*someone on*



*each IEP team know about the AT the child might need”* (p. 67). Behrmann & Schepis (1994) found that the more removed the AT evaluators were from the daily setting, the more expensive and complex their recommendations for AT (Reed & Bowser, 2006).

Because of this information, I questioned the need for a professional who could aide schools in AT implementation. For example, where does the team find time to learn about the products? Is there anyone with the desire or inclination to learn? Is there anyone at the school who knows more about AT? As important as it is to know about AT, there also must be a willing attitude to learn by the school team members.

Bowser (2003) suggests AT should be implemented according to a collaboratively developed plan. AT should also be integrated into the curriculum and daily activities of the student. It then becomes a shared responsibility of team members. Students will use multiple strategies to accomplish tasks and the use of AT may be included in those strategies. Training for the student, family and staff is an integral part of implementation. People responsible for the management and maintenance of any equipment and materials must be recorded in the P3 for contact information. AT implementation is finally based on assessment data and performance data (Bowser, 2003).

### *Abandonment*

The Assistive Technology Centre (2000) cited a quote by Linda Roberts, Director of Educational Technology, US Dept. of Education that emphasizes the need to be “people centred” when making considerations about AT services:

*Technology is a tool that serves a set of educational goals, and if we don't think about what we want the technology for first, we end up with technology-driven solutions that have very little impact in the lives of children and in our educational system (para 8).*

While IDEA '97 required that AT be considered for all children with disabilities, many educators have little experience in implementing this requirement (Reed & Bowser, 2006). Since, then, many States have developed frameworks for implementation. It is critical to provide appropriate training for educators and users alike.

Respondents of a survey on challenges of AT use in special education said that lack of training was their biggest barrier to using AT. Respondents claimed that not only did they not know about the AT, but that lack of resources, materials, time, and funding were also critical areas. It is crucial that school districts and teacher preparation programs actively collaborate to provide classroom, in-service, or online training (Ashton, 2006).

This is further reiterated by Thorkildsen (2006) who suggested that acquiring AT is often hindered by a variety of factors such as a lack of awareness of AT by professionals and consumers, lack of training, lack of funding, and not allowing AT to leave the classroom.

Phillips & Zhao (1993) conducted their own study on AT abandonment in adults and found that devices were abandoned because of lack of consideration of user opinion and selection, poor performance, and change in the user. They also found that lack of training contributed significantly to AT abandonment and they concluded that nonuse of a device could lead to a decrease in functional abilities, freedom and independence. It also represents ineffective use of limited funds by government agencies and other provider organizations (Thorkildsen, 2006).

Scherer (2005) stated that “*in order for abandonment not to occur, three aspects:*

*the milieu in which the person uses or will use AT, the personality of the user, and the characteristics of the specific technology must be considered (p.127)*

The consequences lack of knowledge about AT and about AT implementation are high. Elizabeth Lahm (2006) suggested, *“the lack of special education training programs that address technology and AT services perpetuates the state of AT implementation today (p.722).* Lahm (2006), stated that a high percentage of teachers in the United States do not feel adequately trained to integrate technology into their instruction. For students with disabilities, AT skills can mean the difference between independence and dependence in non-work areas of life, and these skills provide a quality of life not possible otherwise.

Several State programs have developed standards specific to AT over recent years to support educators. On-line teacher training, self-directed AT professional development, and State standard AT implementation projects have been created to support AT. A sample of some suggested websites can be found in Appendix E.

### *Quality of Life*

*Quality of life is the sum total of the way we feel and think about ourselves, the environments we put ourselves into, the kinds of people we associate with, the systems and institutions with which we choose to become involved, the goals we have, the opportunities we are able to pursue, and the belief we have in our potential to effectively act on our environments (Scherer, 2005, p.86)*

Scherer felt that educators often are so taken with the potential benefits of devices to use with people with disabilities, they tend to overlook the quality of life of the individuals who will use the technology. Scherer was speaking more about adults with

disabilities whom she has studied, but educators and families alike must take into consideration this important aspect of the person with disabilities' life. Scherer believes that people need to look beyond the individual's disability. The focus becomes how to enhance a person's quality of life, not merely to restore capability. From this point of view, educators and caregivers then become person-centered. AT then, must attempt to foster independence and autonomy and contribute to a positive identity, enhanced self-esteem, and improved quality of life (Scherer, 2005).

Educators need to be aware of the purpose of having their students use AT devices. Time must be spent on identifying all needs of the individual. There is a tendency to believe that educators can "fix" the student by giving him/her a device to use. However, we need to be cognizant of when and where the device will be used, as well as the social impact of using the device among the students' peer group. Teachers may also need to explain to the student's class where he/she is using AT and explain why the student needs the device and how it will help him/her.

### *AT Assessment*

*The need for AT should be an integral part of a comprehensive assessment for a student in all areas related to his/her disability and /or educational needs. AT considerations should be part of a collaborative school-based approach that includes service providers who are knowledgeable about the child's disability and the aspects of AT associated with the disability (Bowser, 2003, p. 16).*

Hand in hand with technology implementation is the question of assessment. How do educators evaluate? What do they assess and will technology really make a difference in the lives of their students? There has been much focus on the types of devices available; however, not as much attention has been given to assessment.

The key to successful assessment of AT is to keep the student at the centre of the

AT assessment process. AT selection cannot be chosen solely based on the students' needs or desires. The student may outgrow his/her need for a specific device or, as attractive and exciting as a device may seem, it may be totally inappropriate for the student's abilities. When this happens, the device is abandoned. Although a student may be capable of using a specific device, he/she may not use it due to its limitations to suit the student, for example, the keyboard is too small for his fingers, lack of dexterity in fingers, technical difficulties of the equipment, etc.

It is crucial to incorporate technology goals directly into the students' personal program plan with the intention of conducting trials in the device and in specific settings with the student. This allows the teacher to evaluate how the technology is being used, the difficulty or lack of difficulty the student has with it and the practicality of using the device. The constant reassessment of both the P3 and the technology being used will keep the student at the center of the focus of the process.

*AT use in the school – or in any environment – is only as effective as the assessment of the learners in their multiple environments. Effective AT assessment leads to finding devices that build on the strength of the learners in their various environments in order to ameliorate the weakness in their environments (Beigel, 2000, para 12).*

Educators should begin with the student and their multiple life environments, finding where the environments affect the learners in troublesome ways. Then they should look for a device that diminishes the impact by building on the learner's strengths.

The purpose of AT assessment is to find ways to meet the needs of the learners by matching the strengths and weaknesses of the learner (Beigel, 2000). During the initial assessment process the learner's strengths and abilities must be at the forefront of assessment. These considerations are what AT frameworks are created for.

Various AT implementation frameworks have been developed to help school teams and school divisions in creating their own programs. As the focus of this study was to show how the students interacted and used the various AT devices and strategies in different environments. Wisconsin, Oregon, and Kentucky are just a few States that have developed extensive AT implementation plans. Some forms for implementation in the present study were borrowed from these plans, others I created myself. However, each school division must create documentation that relates to current school division practice. AT implementation forms are readily available for the general public to peruse through various websites.

## Chapter Three

### Research Design and Methodology

#### *Research Design*

I chose to perform a case study as it lends itself well to observing classroom life and because of the desire to provide rich descriptive data and draw some insight from it. The study is intended to produce an understanding of the ways in which the participants interacted with their AT and how they attempted to focus on the whole child. Case study research lends itself to this type of study that was done on a small scale with two participants in their natural setting. Yin described case study as an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident (Rose & Grosvenor, 2001).

Bassey (1999) identified three forms of educational case studies: (a) theory – seeking and theory-testing, (b) story-telling and picture drawing and, (c) evaluative. For the purpose of this study, the second type, “story-telling” was the most beneficial because I attempted to portray an accurate picture of events and demonstrate what occurred within the structure of the classroom setting when the subject was being observed and when observations were made at home by the parents. This in turn could be helpful for others to observe. Story telling is also concerned with seeing what happens in a given situation in order to inform further action or to confirm a view (Howley, 2001).

In reference to generalization, I am not suggesting that all or any of the approaches/techniques or materials used can be generalized to other situations, and I

caution the reader that the findings are context-bound. I merely hope that the study will illustrate the importance of AT in one context, and provide an example of how one school team used an existing framework to explore AT.

This case study was conducted in an emic perspective, shown from the point of view of the participants, (i.e., the students, the parents, and the educators). I attempted to find clues as to how the AT implementation worked for the participants and report on the findings. I chose to observe, interview, collect field notes and analyze the data all in the students' natural learning environment and at home. This is the only way to conduct this type of case study in an attempt to find answers to the questions sought by our school team. This naturalistic research allows other educators to relate the study to their own experience, making the results of the study informative. (Lincoln & Guba, 1985).

Roblyer & Schwier (2003) stated there are two viewpoints related to the methodology of teaching technology in schools. There are the directed instruction strategies, the objectivist view, as found in some software programs that are drill and practice type activities; and there is the constructivist viewpoint, which employs constructivist strategies such as Web Quests that are conducive to exploratory learning. There are meaningful roles for both directed instruction and constructivist strategies, and the technology application associated with them (Roblyer & Schwier, 2003).

The program plans for the students employed more directed instruction strategies than constructivist strategies due to the learning needs of the students. In many cases the directed instruction method would be applied to AT implementation with students with special needs simply because of the nature of the cognitive abilities of the student. Combinations of both approaches may be applied to higher functioning special needs



students as the constructivist strategies allow the student to explore their horizons more.

### *Research Methodology*

In this section, background information of the participants and their family is given, as well as my background as a special educator. The setting, framework for the implementation of AT, the data collection procedures, and the ethical considerations are all covered in this section.

#### *The Participants*

Paul is an 11-year-old boy in grade five who has autism. He has little recognizable speech and is considered a non-verbal student. He functions in his classroom with the help of a teacher assistant and the PECS visual symbols.

Paul has used picture-aided communication or picture communication symbols since beginning school at age five. In the beginning, simple pictures both of real objects and people and some symbols were used. The school later adopted out into the Boardmaker symbols (Mayer-Johnson, 2006). They remain the primary picture symbols that he uses. He began using the PECS communication system a few years ago, because the school previously had no training with the system. Paul continues to be on the fourth of six phases (see page 20). At times he initiates what card he wants but is more often prompted for a response.

Paul regularly attends the children's center where he sees a doctor specializing in autism. He has not been able to have an intelligence test so it is difficult to determine his current level of understanding. He is considered non-verbal, having only a base spoken

word count of approximately ten words. He is encouraged to speak, and does so more at home. His speech usually consists of repetitive speech rather than self-initiated speech. Our speech pathologist recommended that we attempt to teach using whole words with pictures rather than phonetic speech. He will sometimes say the beginning sound of a word when looking at the picture but does not blend sounds together.

Paul has stronger receptive skills than expressive skills. He understands commands and responds to questions. He sometimes understands comments from others but is unable to respond to them. His educators continue to seek and uncover ways in which he can express himself. Cards have been made to show emotions and expressions, however, if asked how he is feeling, he is unable to show a card and it is clear that he does not understand what you are asking. Parents receive similar responses from him at home, but because they know him better they feel they are able to determine his moods.

Academically, Paul is weak. In grade four he was able to find all the letters in his name and spell them with magnetic alphabet letters. He is unable to print letters independently as he does not understand the alphabet. He writes hand over hand with his TA. A goal this year was for him to independently write his first initial of his name so when he handed in an assignment he could put his name on his paper. This goal was achieved at the end of this school year.

At the beginning of the school year, our autism consultant was called to the school to give a presentation to his class on what autism is. Her talk seemed to give the other students a greater understanding of who Paul is as a person, why he is different, and ways that they can be his friends. Her suggestions also helped when we partnered students with Paul during school.

Paul began having seizures just before school started last fall. He had four grand mal seizures and had to be hospitalized after some of these episodes. The school team also believes that Paul had smaller seizures throughout the day without losing consciousness. There was no known cause for the seizures. The doctors have been unable to explain to the family the causes; however, he is scheduled to have an MRI in the summertime to determine the cause.

The second participant in the study was Paul's older brother Tim. Tim is a 12-year-old boy who was in grade seven. He is diagnosed with having higher functioning autism. He is verbal and works in his classroom with teacher assistant support. He does not work at grade level but is able to follow classroom routines and structure. He often works in the classroom and sometimes with a small group with his TA. He has deficiencies with social communication, particularly in terms of rules, social norms and behaviors. He is sometimes emotionally confused. He does not appear to understand for example, why his friend would be upset with him if he decided to practice a wrestling move on him. When discussing the situation with him, it became clear to me by his response that he does not understand empathy. It did not occur to him that his friend might have been hurt and angry. I worked on a social skill program with Tim this year. Although he can recognize emotions in pictures of people, he does not seem to understand his own emotions. We practiced emotional understanding by acting out scenarios with friends and discussing situations with him. This will most likely be a long-term challenge, and will need to be a continuing goal for him. Visual presentations such as PowerPoint™ slides and comic strips are needed for him to have a visual picture so he can see himself in the situation.

He sometimes has problems with understanding another person's point of view. He is a very pleasant boy; he has many friends and has benefited from full inclusion in school. He plays basketball with the school team and regularly goes to summer camps. He has had little exposure to technology except for the standard computer class in school.

Paul and Tim's interaction in the school is minimal. This is both a concern and a delicate situation. The school team did not want Tim to feel responsible for helping calm his brother when difficult situations arise. In a typical day, Paul can get frustrated and act out as many as five times. We noticed that Tim does not acknowledge Paul when they pass each other in the hallway. However, Tim is usually with his friends so we do not know whether he consciously avoids Paul, or whether he is simply unaware of him. Paul also does not attempt to stop Tim if he sees him in the hallway. If Tim hears Paul crying in the hallway, he has said that he feels bad or sad because he knows Paul is upset. He does not, however, have the capacity or an awareness of what to do to offer comfort to his brother. He indicates that he feels the emotion but does not know what to do with it. He sometimes remains concerned about his brother, on occasion becoming fixated on him to the extent that he cannot concentrate on his schoolwork.

### *The Family*

The family is comprised of a father and mother, the two participants, Tim and Paul, and an older sister. The father is a seasonal worker who is home during winter months. The mother is a homemaker, dedicated to educating herself about her son's disabilities and ways to help support them. The older daughter has no disability and attends university in the community. The family has a large and supportive extended

family in the community who are able to help with the family.

The family also reported strong support from the school and other outside community agencies in the case of both the participants. There is no family history of family members with a diagnosis of autism in either parent family history. They indicated that having two sons with disabilities did not affect the family's decision to not have more children as they had already decided not to have more children.

With Tim, the family noticed the disability around two years of age when his speech was limited. With Paul, he was under a year old and not achieving developmental milestones when he was diagnosed with autism. The general health of Tim has been fine; however, Paul began having seizures just before school started in the fall and continued to have them.

#### *The Researcher as the Special Educator*

Fundamentally I believe that every individual has the right to learn and the right to receive an education regardless of race, religion, socio-economic status, and ability. I feel that sometimes educators disrespect students by offering excuses of why some students cannot learn such as "Their parents can't help them at home" or "He comes from a poor family". In my experience, these types of students often try wholeheartedly to overcome their personal barriers so they may succeed. They deserve to have someone to tell them that they can accomplish what they set out to do. Often, students only want to fit into their social group and do not want to be treated differently. When students are told they have the same expectations and are encouraged to succeed, students thrive with these opportunities.

I have worked as both a classroom teacher and a special education teacher. I

recognize both the benefits and drawbacks of inclusion and feel that the benefits outweigh the drawbacks, the latter of which can usually be reduced by adapting areas in the child's social and academic environment. The most important consideration should be maintaining the integrity and dignity of the student. An important area of our responsibility as professionals is to give students many opportunities to develop self-respect and self-determination skills.

I believe that all children have the right to be in a classroom and that every child learns differently. Inclusion not only helps the mainstream students, it also helps the students with disabilities. Mainstream peers recognize there are differences in others and are very accepting of these differences. For students with disabilities, inclusion allows them to participate in the appropriate social involvement and stimulation they need and which they otherwise would not receive in a segregated class. Inclusion also works best when all members involved participate in how to support the special needs students in the classroom.

As a participant observer in my role as researcher, I have recognized the value of spending more time with the special needs population students that I support. As special education teachers, we are often pulled in many directions to help support the learning needs of students. We often do not have the time we need to work closely with these students after their program is set up and is carried out by the teacher and teacher assistant. In our role as special educators, we need to re-examine areas in our schedules where more individual time can be spent evaluating and supporting our special needs population.

### *The Setting*

The study was conducted in both the school setting and the home environment. In the school environment, parts of the study were conducted in the learning assistance teacher classroom; parts were conducted in the respective classrooms. There was a transfer of devices and strategies to the home everyday.

### *The Method*

School professionals met at the beginning of the year to make decisions on what the P3 and AT inclusion should look like in a school team meeting. Prior to parents entering the school team meeting, goals were reviewed from the previous year; and ways to implement AT goals, and considerations of types of equipment/software/devices available were considered. Any barriers to implementation were considered, such as the type of classroom, the supports available within the classroom, the training for staff and family on AT implementation, and the amount of goals to focus on were considered. Of key consideration was to look at the present level of performance in the various domains and how AT could be integrated as an extension of their learning. Of particular focus was the communication strand.

At the beginning of September, each boy's team met to review the previous program plan and to decide on new goals and strategies the team wished to try with the students. For Paul, two important goals the team wanted to pursue were "wait time" and "turn taking" skills. We wanted to see where we could implement strategies with AT that had limited barriers.

In Tim's case, the team wanted to explore alternate ways he could internalize the

concept of social norms, rules, and expected behaviors. The team found that often Tim would get into trouble at recess and in class and receive a punishment. One complication was that Tim did not understand why he was being punished. The problem became apparent that Tim needed a way to help him internalize social and behavior rules. Because Tim does not have the physical appearance of having a disability, often times, staff and others forget that Tim does have a disability.

As mentioned at the beginning, specific technology was in place at the school which the team used to match the learning needs of the participants. Both boys made use of a laptop computer to either type with or to use adaptive scan and read software or talking word processor software with. A digital projector was transported to their respective classrooms to show presentations made for the classroom.

### *The Framework*

I felt that I needed a framework that could help the team decide on appropriate AT strategies and implementation. The intent of using a framework was not to provide a structure to generalize research results of AT implementation. Rather, I felt the team needed to have a framework for appropriate AT planning and execution. Much work has been done in the area of AT implementation and evaluation in the United States, some of which I applied AT strategies drawn from a summer symposium I attended which was offered through Alberta Learning in 2005. The Alberta Learning department has done extensive work in the area of AT implementation. The presenter, Gayl Bowser, focused her presentation on showing participants how to use the SETT and Re-SETT framework, created by Joy Zabala, for AT implementation (see table 2).



Table 2

*The SETT and Re-SETT Framework*

## The SETT Framework

Student: \_\_\_\_\_ Date: \_\_\_\_\_ Perspective \_\_\_\_\_

What we know	Student	Environment	Tasks	Tools
What we need to know				

## Re-SETT for AT Implementation

Student: \_\_\_\_\_ Date: \_\_\_\_\_ AT Device: \_\_\_\_\_

Changes we anticipate due to the student's AT use	Student	Environment	Task	Tools

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Note. Adapted with permission from: AT Model Operating Guidelines. 2/18/2003.

[gayl.bowser@douglasesd.k12.or.us](mailto:gayl.bowser@douglasesd.k12.or.us)

Tables were developed by Joy Zabala, Educational Specialist. [joy@joyzabala.com](mailto:joy@joyzabala.com)

This framework was introduced to team members during the initial school team meeting. Decisions were made on the types of goals, the implementation of the goals, and the checkpoints to view the results. Training times, responsibilities of training, data gathering methods and responsibilities of team members were also discussed that this time. The team met regularly throughout the year to discuss changes to programming. Along with the framework worksheets, the team used forms that I created that coincided with the goals of the school division regarding planning.

The SETT framework is an organizational tool or guide used to help collaborative teams gather data that can be used to guide collaborative decisions about services that promote the educational success of students with disabilities in order to make effective AT decisions (Zabala, Bowser, & Korsten, 2004). SETT is an acronym for S (Student) E (Environment) T (Tasks) T (Tools). This framework is based on the premise that in order to develop an appropriate system of AT devices and services, teams must first develop a shared understanding of the student, the environments in which the student spends time, and the tasks that are required for the student to be an active participant in the teaching and learning processes (Zabala et al., 2004).

Because of the vast array of devices, making the right decision regarding the purchase of AT devices is difficult and making the wrong decision can be very costly. Zabala (2005) suggested that even when the needs of the student have been documented, if the environment and tasks within the environment are not considered, abandonment can be high. The use of this framework helps create an atmosphere in where the information, skills, attitudes and observations, of the students, families and school team members are valued and respected.

Specific to the SETT framework is each letter symbol that represents an important area of consideration, that of the student, the environment, the task, and the tools. In each area, important guiding questions are asked to support team members in making sound decisions on goals for the student.

*The student:* Reflection questions with respect to the student include: What is (are) the functional area of concern? What does the student need to be able to do that is difficult or impossible to do independently at this time? The students' special needs, current abilities, interests and preferences must also be considered.

*The environment:* The environment relates to anything or anyone in the vicinity of the student in places where the technology is used. All environments need to be considered, the home, the school, and the community. Considerations on the physical set up of the equipment, the instruction phase, and the responsibilities of the support personnel responsible are important when making team decisions. Attitudes and expectations of the family, the staff and the school division can influence these decisions, because without support from all members of the team, the process will break down.

*The Tasks:* Tasks refer to what is happening in the environment. Questions pertaining to this point include: What activities will take place, Which will enable the student to achieve their educational goals, How will they participate with their peers? What tasks occur in the student's natural environment that will help support these goals? What specific tasks are required for active involvement in identified environments? This would include things like presentations, group involvement in class, and the type of end product expected of the student.

*The Tools:* If the student requires technology to support his learning needs to meet

goal expectations, the team will need to look at all possibilities. This is where the team needs to consider all types of technology, services and strategies for trial implementation. Not only should high technology tools be a consideration, low and medium technology devices and strategies need to be pursued as well. As important as the high technology equipment is, strategies and low technology devices such as the use of communication cards, boards and schedules may also be included in this section (Zabala et al., 2004).

Once AT has been determined for the student, then the team can revisit the original SETT framework. This part of the framework is called Re-SETT. Getting ready for implementation involves framing a question, clarifying a problem, trying tools and strategies, and planning for need. The team needs to consider any new learning that we expect to see from the student, the environment changes that are necessary, and types of data collection measures to be taken in order to monitor the effective use of AT (Zabala, 2005).

Various forms can be used to help guide the team's discussion. The SETT and Re-SETT framework planning forms helps teams look at all levels of involvement to guide their discussions. The Re-SETT section requires a closer look at the student in all areas of competency. Table 3 shows four areas of competence: operational, functional, strategic, and social. These competency areas are related to the student's ability to use AT and are important team considerations when planning for successful implementation (Zabala & Bowser, 2005).

Table 3

*Aspects of Assistive Technology Competence*

<p><b>Operational competence:</b> How to work it</p> <p>Refers to technical skills required to operate the device or system: does the student know how to turn it on and off, how to position things properly, etc. It also includes skills to use the access methods of the device such as how to save files and keyboard skills.</p>
<p><b>Functional Competence:</b> What to do with it</p> <p>Refers to how well the student can use the device functionally for educational purposes. Does the student know when the device will be helpful for him to use? Has the student acquired mastery of specific knowledge or abilities for which the device was chosen? Examples of this would be Does the student know to leave a space between words when typing? Does the student know how to put words in proper order to speak if he is using an augmentative speech device or do we also have to teach him the function of communication first?</p>
<p><b>Strategic Competence:</b> When to use it and when not to use it</p> <p>Refers to whether the student knows when to use the device and if he can choose the device for a specific activity. The team may need to negotiate when the student will use the tools and what tasks he will use them for. For example, is the device used for all writing or only parts of it?</p>
<p><b>Social Competence:</b> How to use in a social and real-world context</p> <p>Refers to whether the student knows to use the device around other people and if the student has the ability to explain how the device works to other people or what he needs it for. Questions for the team include does the device restrict social interaction? How does the device help the student in social contexts?</p>

Note. Adapted with permission from Gayl Bowser. AT Model Operating Guidelines 2/18/2003 [gayl.bowser@douglasesd.k12.or.us](mailto:gayl.bowser@douglasesd.k12.or.us) Retrieved September. 2005 from <http://www.otap-oregon.org/Publications.htm>

An important consideration in the planning phase is the responsibilities of all team members. Table 4 gives an example of an effective way to determine the responsibilities of the team in regard to the training aspects of AT implementation. This guides a team's

discussion on student, staff, and family training as it gives the opportunity for members to express any concerns they may have about the training process involved with AT implementation. Equipment considerations about storage, maintenance and adaptations should also be discussed prior to implementation.

Table 4

*Implementation of Assistive Technology Device*

Student:
Date of Plan:
Team members:
Assistive Technology device:
Review date:
Student training considerations: <ul style="list-style-type: none"> <li>• Purpose of device</li> <li>• Technology use skills student needs to learn</li> <li>• Amount of training student requires</li> <li>• When will training be provided to student</li> <li>• How will child learn to use the device in different environments</li> <li>• What kind of direct supervision and help the child needs to use device in functional manner (i.e. TA supervision and support)</li> </ul>
Staff and family training considerations: <ul style="list-style-type: none"> <li>• Which adults in the student's environments will require training in the use of device (including members of the community if device is needed at camp for example)</li> <li>• What will the staff and family members need to know about the device and how it works</li> <li>• Who provided training for staff and family</li> <li>• Who is called for technical assistance (inside the school or within division)</li> </ul>
Equipment considerations: <ul style="list-style-type: none"> <li>• Who provides the device and consumable supplies needed</li> <li>• Types of environments the AT will be used in</li> <li>• How the device will be made available in each environment (is the computer on a transportable cart; student goes to a room for access)</li> <li>• Where device is located when student uses it</li> <li>• Will the student need to use the device at home</li> <li>• What adaptations or modifications to device is needed to help student access the device</li> <li>• Who is responsible for device repairs</li> </ul>

Note. Adapted with permission from: AT Model Operating Guidelines. Copyright Gayl Bowser 5/2000

In keeping with Saskatchewan Learning objectives surrounding personal program plans and SMART goals, consistent forms regarding AT goals were made that reflect current

practice. Table 5 is an AT goal planning worksheet that teams use to create SMART AT goals. As SMART goals and AT goal planning share a consistent philosophy of clear, measurable and attainable objectives, it was logical to combine them.

Table 5

*SMART Assistive Technology Goal Planner*

Area of Development/Domain		Student: Date:	
Current Level of Performance/proficiency (use in a tutorial setting – i.e. student has never seen the device and needs to be trained on how to operate device):			
Type of Assistive Technology needed/in place/training:			
Annual Outcome for Device (SMART Assistive Technology goal within the context of a functional activity):			
Short term objective (staged event to trial device):	Strategy to support learning:	Time frame:	Evaluation:

Another consideration when deciding on goals is to look at the task that the student is doing. Task analysis should be considered in planning any goal, whether it is a learning goal related to academics or a learning goal related to AT. When evaluating effectiveness of AT, task analysis breakdown can allow the team to see all parts of the task as a whole and may be able to determine any breakdown points in the student's task completion.

For example, the student is required to complete a task such as picking up attendance cards from classrooms that is a functional daily goal. The team wants to

combine a communication goal by having the student greet the teacher as he stops at the classroom using a talking switch device. There may be up to ten steps involved in the task. As the task is performed, the team is quickly able to pinpoint where any task breakdown points occur. This is especially useful when the team introduces a new device into a functional task. This task analysis chart allows teams to record steps in the task analysis process.

Table 6

*Task Analysis Chart*

Student:		Date:	
Long term SMART goal:			
Task:			
TASK ANALYSIS STEPS			
Step:	Personnel:	Training/assistance or prompts required:	
Review date:		Changes needed:	

Trial phases are important as implementations plans in the environment and considerations on measuring task changes and review dates can be set during the trial phases of AT implementation. Where the framework centers around the student, the extended assessment summary form centers on the specific tools and asks guiding questions the team needs to consider in the training needs of the individuals involved (see table 7). During a trial phase, conditions are set in which to monitor the student's skill



development and barriers to implementation. After the plan is reviewed and questions are answered, the team then can transfer the device/strategies to a functional daily task or activity.

Table 7

*Extended Assessment Summary*

<b>Student:</b>	<b>Date:</b>
<b>SMART goal:</b>	<b>Device:</b>
Aspect of student performance we hope will change:	Data collection measure (checklist, form, interview, etc.):
Expected level of achievement:	How will we know if the trial is not working (criteria):
The type of environment or routine the device will be used (classroom, hallway, LAT room, etc.):	The type of task the device will be used for:
The way the student is expected to participate:	People responsible for implementation:
The days the device will be used:	The times during the day the device will be used (consider student fatigue):
The date of the trial period:	The length of the trial period:
The review date of the trial period:	The person to contact for technical assistance:

*Extended Assessment Summary Continued*

<b>Summary</b>	
Does the child's performance change when using the device? How?	Does it change the student's communication level? How?
How does the student like using the device? What are the indicators (i.e., does he reach for the device when he wants it)?	What are the advantages of using the device? What are the disadvantages of using the device?
In what functional activity/routine/task will the device be used? Does its use enhance support to complete the activity or does its use prevent the student from doing the activity?	How long can the child be expected to use the device?
What are the barriers to using the device (training, support, time, attitudes, ability – of all team members)	Is the student experiencing frustration and if so, at what point when using the device?
Is the device appropriate for the task?	Does the technology present itself as a barrier in a given environment? Does it create an unnecessary barrier?
Extended assessment team recommendations	

Note. Adapted with permission from AT Model Operating Guidelines Gayl Bowser Gayl Bowser and Penny Reed. Copyright: October 2002.

### *Data Collection*

I chose reflective reporting as I conducted the study in my school setting and had daily contact with the family, participants and colleagues. I was attempting to provide a sense of the people involved, to understand the intentions of the participants, their family and the educators supporting them (Gall, Gall, & Borg, 2003). Because one of the participants is non-verbal, our school team had to make assumptions of the student responses and attitude based on observation and other participant involvement.

Data collection was comprised of the following four elements:

1. Questionnaires from students, parents and school caregivers.
  - a. Tim filled out the handbook, “Hey, Can I Try That? A Student Handbook for Choosing and Using At” created by Bowser and Reed (2001).
  - b. Parents completed a parent feedback on AT sheet reproduced from Alberta Learning (2006) (see Appendix C).
  - c. Teachers and teacher assistants filled out a questionnaire near the completion of the study (see Appendix D).

2. Finished work projects based on AT use.

3. Observations of the student while using AT in different environments.

This included some descriptive data and some event data recording. An AT data collection handbook entitled *How Do You Know It? How Can You Show It?* (Reed, Bowser, & Korsten, 2004) informed the data collection.

4. Video taping presentations done in the classroom so the student could watch the tape and talk about what happened, which is especially useful when part of the objective of the learning environment includes a presentation aspect that is given a presentation mark. This is also an excellent way to promote inclusion as an alternate form of assessment. Videotaping was done in the classrooms strictly for instructional purposes, and only incidentally contributed to data collection and analysis. Videotaping is allowed in the school setting when the parents agree to sign a media release form at the beginning of the school year. A participant's presentation was video taped when it was an expected component of the curriculum objectives.

### *Data Analysis*

Data were collected and compiled into each of the four areas of questionnaire responses, finished work projects, observations (description and event data gathering), and presentation feedback. Reflection and interpretation of questionnaire answers, observations and responses of students and observation of student performance and presentations presented the opportunity for emerging themes.

The four modes of data were unique on their own, each giving the school team valuable insight and significance into the questions asked in the study. Under each area, data were collated into a SETT chart, with information being chunked into each category: student, environment, task, and tool. Separate files were kept for data collection in each of the areas. Key words were identified and important areas of information were marked

in a colour coding system for easy reference. The information was then cross-referenced with the student program plan at different times throughout the study. This allowed the team to review emerging themes, re-examine research questions, tabulate results, and make appropriate changes to goals and objectives. This allowed the researcher to examine each area closely, looking at themes emerging because each section was integral to successful implementation. Charts that were used in the study for implementation of AT were also thoroughly examined for key words and information that matched other data collection results as they provided rich information in each key SETT area.

Answers from the questionnaires were examined to determine quotations used throughout the thesis and to determine which information was relevant for charts created. The charts in the questionnaire section of this thesis are an attempt to capture the moments during the course of the study that show readers the lived experiences of the participants. These quotes and responses of participants were not altered to show the effect of the applications of AT use and participants own interpretation of events.

Analysis of the research questions showed the culmination of the interpreted results of AT devices and strategy implementation and the reaction of all participants. This analysis was determined based on responses of the participants and evidence found in student work. Significant findings were the result of data analyzed in each of the areas of data collection where the student showed significant growth. This was determined by tracking different events and recording changes as the environment, tools or tasks were altered. Responses of educators involved in supporting the student were also considered. When all data had been analyzed and written, I reviewed the final product with the parents.

*Ethical Considerations*

A team was in place that included both internal and external team members who were involved in the participants' programming. These people included the student, the parents, and the researcher/learning assistance teacher, the classroom teachers; the teacher assistants assigned to each student, an autism child specialist, the speech and language therapist and the special needs consultant. All outside support staff were aware of the study and were present in the school at various times throughout the year for support.

Technology was available to help support the learning needs of the participants. Various AT devices and strategies were employed by the team to meet the social, reading, writing, designing, and oral communication needs of the participants, and the tools were incorporated into the program plan in different degrees for both participants. Goals for each student were made surrounding the programs and devices that were taken home, for example, the computer was taken home with them each night with specific goals in mind for participants to work on.

Monthly meetings with team members were established with the realization that not all team members may be able to attend. As one parent was in the school daily, ample opportunities for discussion existed with school team members throughout the year. Communication occurred daily between the home and school; therefore, any concerns were addressed quickly. Formal meetings to discuss program changes were held every three months and to share in observations and discuss goals of each participant. Phone numbers of school division members and the principal were given to the participants' family if they were not comfortable discussing issues with me.

The participants and their parents already knew me in my capacity as a special educator. I contacted the parents directly to obtain permission for their children to participate in this study. The parents and students were in no way coerced to participate in the study. They were not promised technology devices if they chose to participate in this study, as the schools technology would have been available regardless of their participation. Both participants also had support to read and sign a form of consent, shown as an example in appendix A. Although my role with the participants was a dependent one, the threat or pressure to participate played only a small role due to the nature of the study and that as the special education teacher; I was already assigned to these students and was known to the family.

I had the primary responsibility for conducting observations and recording results. I also relied on other team members, such as the teacher assistants and the classroom teachers to share their observations, and thoughts and attitudes about the study. Review of the final P3 along with suggestions for transitions and goals to continue were discussed at our final school team meeting at the conclusion of the study.

## Chapter Four

### Results

This chapter shows the four modes of data collection that was used. Each of the four types of data collection was relevant to the findings. Of these four types, the richest source of data collected came from the questionnaire responses. The themes of the study emerged primarily from these responses. The themes of time, training and attitudes were most prevalent based on the questionnaire responses. Attitude was a critical theme because the attitudes of the educators and parents influenced the environment and expectations of the students and their learning opportunities. These themes were also present in the observation and presentations data collection areas. The questionnaire responses make up a large section of the results, and provide an opportunity to see the human factors present. They are presented first.

#### *Questionnaire Results*

##### *Student Questionnaire*

I received insight from Tim on how he felt about AT and AT strategies that he would like to use on a trial basis when he filled out sections in his student handbook on AT mentioned previously on page 65. . He filled out the first part early in the year to gather information on what Tim felt he was having problems with. We first discussed what areas in school were the hardest for him. He wrote that he felt writing tests and copying notes were hard. We then discussed ways AT could help him, what he would like to try, and how to create a plan with a goal in mind. We discussed what devices the



school had that could help him. He indicated he would like to try using the computer in the classroom for taking notes. He also wanted to try taking his tests on the computer. A section in the handbook asked how he could help himself learn the skills he would need to operate the devices. He agreed that he would practice with a typing program so he could type faster. He also agreed that he would come to my classroom at designated times to learn how to use the programs.

Later in the year, we revisited the handbook and filled out the sections related to how the AT worked for him. He felt the computer helped him take notes better in class, but that it sometimes took longer. He concluded that he would only like to use the computer in class in certain classes. I agreed that sometimes he still needed to write out notes and copy from the board. These discussions gave him an opportunity to discuss reasons why he may have felt that some things worked for him while other things did not. This handbook provided an excellent opportunity for self-determination in the student. It gave Tim an opportunity to feel that he was contributing to his own learning, and making decisions about what he was doing.

Unfortunately, Paul was not able to fill out questionnaires, so the team had to determine other ways to measure his use of AT. Paul has been in the same school since Kindergarten and many of our teacher assistants have also been at the school for a number of years. One teacher assistant worked with him the previous year. They were used to Paul's moods and had a good grasp on his tolerance levels of time on task. They had developed strategies to calm him down in activities throughout the day. They also understood the type of sensory stimulation he needed.

The team members were alert to signs where he was experiencing frustration

with AT and were able to re-direct him. For example, if the computer was not set up with the adapted keyboard when it was time to use it, Paul would not want to wait. He would attempt to sit at the desk, but he would begin to make loud noises, and sometimes start crying and putting his wrist in his mouth. These reactions indicated Paul's agitation. It seemed that Paul's success with the technology depended on his varying moods. This was corroborated by the TA, who indicated that Paul's success with technology depended on his mood or frustration level on any given day. Sometimes Paul would not get anything done on the computer because he cried for the five minutes as he sat at the computer. The TA also added, "You need to know when it is time to say we are going to get to work and also when it is time to say okay, we are not going to do this today, let's do something else."

Paul's enjoyment in using AT was noticeable when he was able to show his classmates presentations. His enjoyment showed on his face when he brought the equipment into his classroom. He smiled and gave a couple of kids high fives (a common social gesture indicating success). When he started the presentation going, each time he typed a sentence and the computer read the sentence, Paul turned around to face his audience and started clapping for himself. The rest of the class joined in. After every sentence in his presentation, the same reaction occurred. In a discussion with his mother after of the presentation, she expressed that she had never before seen him so excited in his classroom.

### *Parent Questionnaire*

Parents completed the Feedback on AT Form (see Appendix C) in December 2005, a few months after AT implementation. Questions were asked regarding AT

implementation. They were asked first what changes they saw in their child's performance since using AT. Parents felt that for Paul, using a talking device helped him interact with his peers better. Reading books and social stories on the computer also helped him understand what he was reading. Parents also felt that reading books on the computer was beneficial for Tim's comprehension, and using the computer in the classroom was helping him stay organized and focused.

The parents reported that the benefits of the AT implementation for Paul were more communication and understanding, longer attention span and more academic awareness. For Tim, the parents felt that he had added self-confidence, greater comprehension and more language awareness. Drawbacks to success were that AT workshops and training were difficult to receive. They reported that AT was beneficial for Paul and that using these types of devices would help him achieve independence (i.e., communicate in public).

The parents' question for the school team at that time was whether the AT would still be available to them once the study was over. They reported that they would not like to see the devices taken away as they were extremely helpful. Their thoughts at that time were that the boys were showing surprisingly positive results in learning how to operate the devices. They felt that Tim demonstrated a willingness to practice to become proficient with the AT.

The second parent questionnaire was sent home had two sections. The first section dealt with personal questions of which the following comments are from. The second section dealt with specific technology applications used and how parents felt about them (see Appendix B). They are presented next along with student responses and

teacher/TA responses.

The following are the personal questions and answers that parents were asked. The parents were given a copy of these questions that they filled out and brought back to the school to discuss. Only direct quotations appear as block quotes. Other data are drawn from the questionnaires and are paraphrased.

*Is Tim aware that he has a disability?*

Tim was told when he was younger that he had a disability; however, the family recognizes a need to speak more to him about why he sometimes has difficulty following rules, or why he has trouble reading and remembering. He finds it hard to understand his disability as he sees his brother with autism and he knows he does not have the same problems. He knows he sometimes does not understand things, especially some social situations, as well as the other students.

*Does Michael every talk about feeling different from other kids?*

The use of social stories created with PowerPoint™ on the computer and comic strip conversations have helped him tremendously in understanding and remembering. Tim knows that sometimes his classmates are envious of the technology support he gets but they understand his need for additional assistance. Most of his peers have been with him in school for a long time and know he needs to do different work than them sometimes. Tim would like to do more of the same work his classmates are doing and he can sometimes do this with technology support.

*How old was Paul/Tim when you first thought that each child may have a developmental disorder? What is the general health of your children?*

Paul showed signs of a delay when he was under two years old and has always had speech problems. Tim showed signs of a delay around two and a half years old. Both of the boys are seen regularly at the children centre so they can keep updated with their autism challenges. Their general health has been fine; however, Paul developed seizures at the beginning of September.

*Are there any forms of outside agency support that you have found more beneficial than others?*

The school has been a huge support in academics, guidance and support. Autism services have a number of supports for families with autism. Summer camps are provided which the family uses every year as the boys have needed the social interaction with peers and they offer an opportunity to learn valuable life skills. There are also summer programs offered by the City where the boys can participate with their peers, some with special need and others without.

*The leaders of the camps are a bit leery of Paul but soon get to know him and are very supportive of Paul and wish people would not be so cautious of getting to associate with him. When they first meet Tim they don't see him as special needs but after a couple weeks change their views –which teaches them not all disabilities are as visual at first glance. These programs help society and special needs to understand each other more (parent of participants, personal communication, March 15, 2006).*

*Can you describe the family stressors that have been the most difficult for your family?*

The family is always trying to keep up with current research material from various sources and trying to decide which is worth trying or affordable. There are workshops like PECS that are very costly. Now that Paul has developed seizures the family is learning how to control this with medication issues, side effects, costs, and tests he may need. Also the doctors not knowing the cause of his seizures and not knowing if

behavior outbursts are autistic or seizure related are related issues the family is dealing with.

Paul needs much occupational therapy but the family also has added costs in other areas. Tim also has disability issues that need to be researched and he is a preteen who does not understand why he is having different feeling like mood swings and body changes. This brings a new set of issues the family needs to discuss with him.

*Can you describe any reactions to having a child with autism within the classroom?*

The students in Paul's classes have always been very accepting of him as most have been in a classroom with him at least half the time throughout his six school years. When there is a new child in his class, the child is usually interested on how the PECS cards work and have many questions about why he does not talk or why he is not toilet trained. His classmates are very helpful in explaining to new classmates how to talk to Paul and how to play with him. There has only been one instance where a parent has voiced displeasure with having his child in the same classroom as Tim. The child of the parent teased Tim about having a disability and the situation had to be dealt with.

*What are your concerns for each of your children when being placed within the structure of a high school?*

The family is always worried for Tim's safety because people don't always realize he is child with special needs and they mistake his innocence for sarcasm. He is easily talked into or influenced to do things or not tell things that can put him into danger. His classes will become harder and he will have less support from school personnel. He also has huge social skills concerns. Paul is not toilet trained which is a concern for his

parents. He needs academic accommodations that are at his own level and that are challenging to him. Parents also have concerns about losing the one-to-one care and support that he receives at elementary school.

*What are your thoughts on the care and support the boys receive at the school?*

*Our school is giving our sons the best chance to education and to having the feeling to be included which we will always be thankful for. The forms of encouragement and support will never be forgotten and will show through our boys' lives because of the great job they are doing (mother of participants, personal communication, March 15, 2006).*

The following chart shows comments by school personnel and the family involved in the study on the different applications in devices and strategies used in the study. In some instances, not all factors required responses from each of the members.

On Tim using the pocket computer:		
<p>Tim</p> <p>I like the calendar thing. You can type it on there instead of writing it all down. I record stuff I have for homework. It is kind of hard to do notes on because it is very touchy. I liked doing all the other stuff on it though.</p>	<p>Parent</p> <p>This helps him keep on track whether through notes or organizing, remembering information</p>	<p>TA</p> <p>It is somewhat successful as a daily planner and he enjoys using it</p> <p>It was difficult to use for note taking as set up was long and the beam did not always work.</p> <p>It took too much time at the end of the day to record the homework and he had to be out of the classroom for it.</p>
On Tim using the read and scan and read software:		
<p>Tim</p> <p>If there are big words I can't read the computer</p>	<p>Parent</p> <p>This has helped him to improve his listening and</p>	<p>TA</p> <p>Tim has requested that his stories for LA be put on this</p>

<p>reads it to me.</p> <p>Reading books speaks to you, you just turn the pages. I like doing the tests a lot. When it reads to you, you probably know the answers a lot better than reading it to yourself. I do better on tests.</p>	<p>reading skills. It also helps him understand and answer exam questions.</p> <p>The software gave him a different form of silent reading which, for someone who does not enjoy reading, he prefers this method. He seems to comprehend better the article and gives him the opportunity to reread it as many times as he needs to.</p>	<p>software so he can pre-read them at home.</p> <p>This gives him time to absorb what the story is about and make appropriate comments during class discussion.</p> <p>He completed tests and worksheets independently with this program. This increased his level of understanding and the level of marks went up significantly.</p>
On using the Laptop computer:		
<p>Tim</p> <p>If I just write the notes and have to read the book it can be a lot challenging. Words go all over the place sometimes. Sometimes I like to write notes, sometimes I don't.</p> <p>I think a smaller computer would help me to use in high school. It is not too big and not too small. I can carry it around in my backpack. The pocket pc is small and I might lose it.</p> <p>On doing power points: I get to use the laptop and the digital camera sometimes. I do them to help me remember the rules. It helps using pictures instead of writing it out. I can remember better.</p>	<p>Parent</p> <p>This helps him to be able to do note taking which he can understand and help spelling errors. It also helps him to start being more organized with his work so able to do the work better and complete it on time.</p> <p>The laptop gave him the benefit of having information on hand and if he needs to work on assignments it is accessible at home. It also gives him a lot more options for creativity and more independence in doing his work and research.</p>	<p>TA</p> <p>Tim has gained confidence when taking notes in class. It helps him organize his notes and makes reviews of subject matter easier as all information is there.</p> <p>The look of his assignments is more on the same level as peers.</p>



On comic strip conversations:		
<p>Tim</p> <p>After I write them, I won't do it again because I would get into more trouble. When I just write down what happened (in a situation) I kind of forget something. This helps me remember better cause if I don't know what to say I think of it – the picture of the comic strip comes to my mind</p>	<p>Parent</p> <p>He remembers a situation better when he has to write the story out and explain it to me.</p>	<p>TA</p> <p>It is a very useful way to remember a situation as he has to think it out, draw what and how he was feeling but also the other person(s). He has to explain the situation to his teacher or LAT and say what he could have done. Gives him ownership because he has to keep them in a binder.</p>
On power point social skills stories:		
<p>Tim</p> <p>It was fun using the digital camera to get into situations that we could take pictures in and then put the pictures in the power point. They helped me remember and think about why I did them. The pictures help me remember better.</p>	<p>Parent</p> <p>He really enjoyed seeing himself in the power point story and helps him remember better as it is very visual.</p>	<p>TA</p> <p>Tim has been participating appropriately in class (putting his hand up to ask a question), which is due to his watching a power point presentation. Sharing social stories with class allowed him to further develop his presentation skills. When stories were created with power point they were much more effective when created in this medium. The visual components make his retention of concepts more likely and he relates to pictures of himself better.</p>
On follow through with home and school:		
<p>Tim</p> <p>I can do my homework better because I can take the computer home to do my work on it.</p>	<p>Parent</p> <p>Having the computer gives him more opportunities to follow through between home and school in doing his assignments as he can pick up where he left off on</p>	<p>TA</p> <p>We had very good communication because the parent was in the school and we could discuss homework concerns and what we were doing in class.</p>

	<p>research or notes or assignments. This gives him more independence, which has built up self-esteem.</p> <p>We have good communication with the school and are always able to get information when needed and school is kept updated at home progress when necessary.</p>	<p>Tim also had a daily planner that we both wrote in daily, which facilitated good communication.</p>
On technology training:		
	<p>Parent</p> <p>We received adequate training and lots of patience on our trial and errors. The end results have proven worthwhile and we are more comfortable with it. The rewards have proven it all worthwhile.</p>	<p>TA</p> <p>Time is a big factor in learning the devices and monitoring the devices.</p>
The most surprising thing with technology:		
	<p>Parent</p> <p>The read and scan program made a huge difference for him when doing his tests. He is more willing to silent read using the program. Technology will be a stronger factor in helping him keep on track with notes, organization and reading.</p>	<p>TA</p> <p>With further training he can use computers for educational and personal use for the rest of his life.</p>
Outcomes with the involvement of technology:		
<p>Tim</p> <p>If I don't know how to read and stuff I can use technology to read and use a calendar.</p> <p>I think if I could e-mail my assignments then I would not lose any work.</p>	<p>Parent</p> <p>I am very happy with the outcome of technology as they are constantly surprising me with the great results. It is supplying for their education and the increase of the self-</p>	<p>TA</p> <p>The use of technology brings him closer to an age appropriate presentation even if academically he is still quite far behind his peers.</p> <p>It would be better if the</p>

	<p>confidence and communication and independence.</p> <p>The technology is an extension to both boys education as it is used as a tool to help them do their daily schoolwork to the best of their ability.</p>	<p>computer was more accessible in the classroom as leaving the class to get the computer draws attention that he does not want.</p> <p>He is much more organized. His homework is easier to mark and resembles his peers in outward appearances which is something that is important to Tim.</p>
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In Paul's case only thoughts of parents and TA were recorded, as Paul could not voice his opinion:

On using the talking word processor program:	
<p>Parent</p> <p>This gives him opportunities to have inclusion in class subject matter. He can learn at his level but still on the same topic. It is opening doors for his spelling, reading, and comprehension.</p>	<p>TA</p> <p>This technology allows him to make letters and words together to make sentences. Putting a period at the end of the sentence allowed sentence to be read back to him. It increases his vocabulary as he is using new words in new stories he makes. Allows the picture symbols can be used in a new context of sentences. It allowed him to participate in oral book presentations in classroom.</p>
Using the switch device:	
<p>Parent</p> <p>This allows him to interact with his peers and adults by giving him a voice to speak to them.</p> <p>He can read stories with his peers.</p> <p>It is a strong interaction support with fellow classmates and staff.</p>	<p>TA</p> <p>It was mainly used for reciprocal behaviour; reading with a partner, used in hallway with teacher or to converse with another student.</p> <p>When used with stories, he learned to track sentences, knew when it was his turn, when to turn the pages and to wait his turn.</p>

Using the laptop and scan and read program:	
<p>Parent</p> <p>Having the laptop enables him to do follow up of schoolwork at home and his program is consistent. He can use the programs during school breaks and he can get parent assistance and parents can see his level of understanding and academics.</p> <p>The scan and read program has opened doors to silent reading for him.</p> <p>Doing class presentations help give him independence and a sense of accomplishment.</p>	<p>TA</p> <p>He was able to take the computer home and work on the same programs there. This helped in learning how to use the programs and to be more efficient with them.</p> <p>He liked to listen to stories that had been scanned into the computer from the scan and read program.</p>
Overall outcome using AT:	
<p>Parent</p> <p>We strongly support this approach. The use of AT will be a strong support for communication and academic work in his life</p> <p>The technology is an extension to his education as it is used as a tool to help them do their daily schools work to the best of their ability.</p>	<p>TA</p> <p>It has been very successful. He has shown great improvement with the computer programs because he can take them home and work on them the same way he can at school.</p>
Most surprising thing:	
<p>Parent</p> <p>Doing oral book presentations in the classroom with the talking word processor. His ability to sign in and step up in a program on the computer himself.</p> <p>His typing and word making on the computer is the starting point to opening a lot more communication and academic uses for him.</p> <p>We are constantly surprised with the great results it is supplying for his education and increase in self-confidence, communication and independence.</p>	<p>TA</p> <p>He has had a huge growth in participation with his peers through peer reading activities, participating in groups and doing class presentations alone and with groups. He is able to converse more with talking tools.</p> <p>He loves the computer and has been very receptive to learning new things on it.</p> <p>He has had huge growth in learning to copy words, use words to make sentences and to create a story that can be read to him.</p>
PECS program	
<p>Parent</p> <p>We use the PECS program at home as well. It is his main form of communication. We use charts and schedules with symbols for routines.</p>	<p>TA</p> <p>He is able to show someone what he wants, the other person is able to respond to him</p> <p>It is his main way to communicate</p> <p>He is not very initiating, he does not come</p>

	ask for things. He needs more training in initiating with his cards.
On social stories	
<b>Parent</b> Social stories are used at home and school They are great for learning and introducing new things, to understand situations and special activities, when there is a change in his schedule, like if he is going on an outing.	<b>TA</b> They are very good for preparing him for upcoming events, as the pictures are very effective. He reads them till he learns a new activity They are time consuming to make and you need to know how to use the program to make them. They show realistic activities that take place in the student's day to day routine.

#### *Teacher and Teacher Assistant Questionnaire.*

Responses to the teacher and teacher assistant questionnaire are presented below.

A copy of this questionnaire is found in Appendix D.

*What personal frustrations and suggestions with AT devices in the classroom do you have?*

Responses were varied in terms of the level of frustration with devices. One teacher assistant commented that it takes a significant amount of time for educators to find the appropriate lessons for the technology to be used to its full advantage. The same teacher assistant commented that it also depends on the degree the individual is technologically literate. She did not have a problem learning the devices when I sat at the computer with her to show her how to operate them. She did feel that there is never enough time in a day to learn all the operations to all the equipment. She suggested that a school day needed to be set aside to have in-services and learning time for all the devices. A similar response was that there needs to be more training on the device for the TA and

student together to teach the student new things on the device.

Some devices were much harder to learn and were time consuming to maintain. This was especially true if the device had many different functions. One TA pointed out that sometimes the device was not right for the environment if the student showed frustration when using it.

Interestingly, a TA response was the need to teach the teachers more about the technology being used as the teacher becomes dependent on the TA to know what the student is doing. The teachers also commented that they did not feel they had adequate time to learn the devices but would like to learn more about them. However, the issue of where to find time and setting priorities was a prevalent issue for them.

There is not always enough physical space for technology devices in the classroom. The classroom setting is not always the ideal place for the computer program as it may be noisy to use if the student cannot use headphones. On the other hand, one TA responded that she felt Tim might have had more success if the computer was more readily accessible within the classroom because when he had to leave the classroom to get the computer he was more resistant to use the computer.

*Did you feel that you received enough AT training to be comfortable with the devices?*

Responses followed a similar pattern. One person responded that it helped when she was trained with it first but there was never enough time to learn all the operations to all the equipment. Sometimes the technology failed when the participant was using it or it would not start up properly. This was frustrating to the student and staff member if the

adult did not know how to fix it and could not find the person who knew how to fix it. A similar response came from another TA who stated that if she did not know how to fix a problem or where to find something on the computer, her level of frustration rose, which in turn caused the student to feel frustrated.

Again, all team members agreed that there needs to be a day set aside where everyone can learn how to use the devices and strategies. They felt they all needed to sit in front of the computer or device when being trained and needed time to use the device on their own before introducing it to the student. One TA commented that once she was trained, in some cases only parts of the technology would be beneficial to her student. They also agreed that it was helpful to have one person in the school that knew how to operate the equipment and how to fix it when things went wrong.

*What were the advantages of using AT in the classroom?*

Positive responses included the student feeling more a part of what the rest of the class was doing and the inclusion of AT helped modify the curriculum and made peers aware that the student is able to learn as much as the rest of the class. TA's felt that using AT helped the student build self-esteem skills because when the device was used the student was very positive and eager to learn and show what he could do.

One of the most positive aspects was the satisfaction in seeing how student responded to technology especially when the participants were able to share their accomplishments with their peers. The use of AT was also an excellent opportunity to showcase the participants talents in presentations made to the class. This opinion came from both teachers and TA's.

Once familiar with the devices and programs the personnel were much more comfortable with the technology and were more willing to spend the time learning more about the device and strategies they could use to support learning with the device. One TA commented that when she knew what the device could do, she could choose aspects of the program she felt were beneficial to the students learning.

Advantages to the student were that the student does not feel singled out by doing different classroom curriculum as the student can feel more a part of what the rest of the class is doing. This response was the same for both participants. One TA commented that Tim discovered the usefulness of the computer when taking notes and completing assignments. She felt this was especially true when he used the scan and read program, as he was able to get much higher marks in tests. For Paul, his TA noted that she felt the time he spent on the computer promoted a level of independence for him. She did not have to sit beside him if he already knew how to do the program. Using the devices also helped train Paul how to be patient, to wait, and to interact with others.

*Did you notice if one device was more effective than another in terms of helping meet the communication needs of the student?*

Both the teacher and TA felt that the extended use of Paul's PECS cards were very beneficial for him. They commented that the PECS cards were very specific to his day to day needs, The ability of having them transferred onto a computer that he could make words and sentences on, was very beneficial. Other comments were that the talking device helped him interact better with his peers as he could read stories with a peer or speak in a group. All agreed that the computer and adapted keyboard was most beneficial for his learning needs at the time.



Tim had great success with the computer as both teacher and TA felt that it improved his overall classroom performance. He was able to keep himself organized with his notes, able to type notes from the board and print them. The TA could create study notes quickly from the notes saved and create tests for him. Assignments could go on the computer and be sent home without the risk of him losing documents on the way home. He was able to learn how to create presentations and use a variety of programs on the computer. The scan and read program was very beneficial as he could read books and take tests on it.

*How did you think the student's performance improved or change after these devices were tried in the classroom?*

Paul's teacher commented that he does not accept change well. When new devices were incorporated into his daily routine he was often initially resistant. However, after a couple of weeks he would become successful using the device and he would respond with confidence and some independence. She also commented that his level of socialization with his peers grew tremendously this past year. She felt much of this change was brought about by the strategies of bringing him together with a buddy to read or play with, the group work he participated in, and the presentations he created. This was repeated by his TA's who felt they saw changes in his reciprocal behaviour when he was using the talking device to read with a partner, or using it to speak for him. Both TA's felt that there was growth in Paul's ability to wait and take turns, both which were goals for him this year.

Tim's teacher and TA felt that allowing Tim to use the computer helped him work more independently. The computer was used in a variety of ways –for organization, presentations, test taking and note taking. They felt that it was a powerful tool for homework as there was never a fear that he would lose his assignments or outlines. His TA noted that at first he was resistant to using the computer to take notes because it was not physically in his classroom. The computer was shared between himself and his brother and was kept in the special education room. When Tim needed it for class, he would retrieve it from the special education room.

*Anecdotal Records, Observation Charts.*

Various charts were created to support record keeping and maintain data. Sometimes something as simple as using a monthly calendar to track the amount of times the student attempted to say “hi” with his recording device to staff members in one day was used. More complicated observation measures such as recording observations in a timed observational summary while a student is using a device were used.

Paul required more observation due to the nature of his lack of natural speech for feedback. Paul also tried more of the devices and strategies than Tim during the study. Tim was able to provide more feedback and participate in reflective self-assessment to a degree. Data collection measures for both Paul and Tim in this section centered more on performance data and observational data as data was collected in the classroom, the special education room and the hallways of the school.

The following data analysis charts provide examples of the different types of data collection through observations and compiled work the participants took part in during the course of the study. These charts illustrate the nature of data collection that occurred

routinely during the course of the study. The first four charts show data results for Paul, and the last two show data results for Tim.

The chart below tracks a situation in which the team was attempting to have Paul communicate with staff members by saying “Hi” to them. Paul had a daily functional task of picking up attendance cards from teachers’ classrooms. With his talking device, we added a task of speaking to the teachers as he went to the classrooms. This task was tried for approximately one month. As the results indicate, the added task became a burden on both the teacher assistant and the student. Paul became frustrated and started crying, often wanting to give the talking device to the teacher assistant. Initially the team decreased the number of attempts; however, after a month of use, the decision was made to end this task. Paul continued to do the functional task of picking up the attendance cards as before.

Table 8

*Voice Output Device Chart*

<b>Voice Output Device Activations</b>				
Data collected by: teacher assistant and Kelly Huck				
Student:			Date: Compiled over a month period	
Date	Phrase	# Opportunities	# Correct Activations	Observation of student
January 9	“Hi”	10	08	Needed to be guided through task
January 12	“Hi”	10	06	Needed much assistance, showed some resistance
January 17	“Hi”	08	05	Decrease in number of opportunities, wanted teacher assistant to push device
January 20	“Hi”	06	04	Further decrease in opportunities, student used device independently
January 27	“Hi”	06	03	Does not appear to enjoy activity, crying
February 6	“Hi”	04	02	Further decrease, same response, try a different task

Below, a performance data chart shows an activity where Paul was learning how to use the adapted keyboard. The team wanted Paul to practice with an alphabet overlay to see if he could learn to type words. The program spoke the words out loud after the word was typed. The team made cue cards with names of his family and who they were.

The previous year, Paul used magnetic alphabet letters to practice learning how to spell his name. In September and October, Paul continued to practice this way. When the adapted keyboard was introduced, his name was the first word he mastered spelling independently on the keyboard.

Table 9

*Performance Data Chart*

<b>Performance Data</b>				
Data collected by: Kelly Huck				
Student: Paul			Date: data compiled over a month	
Date	# words typed with adapted keyboard	# correct with assistance/without assistance	Time on task	Comments
November 9	5	Completed 5 with assistance – hand over hand	4 min	Typed names of family
November 12	10	Completed own name without assistance, other words with assistance	5 min	Added words mother, father, etc. Student started pointing to each letter and finding on keyboard
November 17	10	4/10 without assistance	5 min	Can type his name, brothers name and parents name by himself
November 20	10	6/10	5 min	Getting better at pointing and finding own letters on keyboard
November 24	10	7/10	5 min	More independent, less reaching for teacher assistant hand for help

The team decided one of the goals during the year would be to have Paul learn how to use the picture communication symbols in a different way. These symbols have been used for functional communication in Paul's environment since he was a small child. The team felt that he could use the symbol cards to learn new vocabulary and learn how to make sentences with word cards and symbol cards. In the following activity, picture symbol cards were created. Some cards had the name and the picture; other cards just the picture and other cards with the name only. The team had Paul practice matching these cards in different ways to check for understanding of these words. The results showed that Paul relies on the picture symbol to know what the word is.

Table 10

*Task Observation Chart*

<b>Task Observation of Student</b>			
Data collected by: teacher assistant and Kelly Huck			
Task outcome: Use of picture communication symbols to increase vocabulary. Student will match a variety of cards with and without pictures or words to check student understanding of the word			
Student: Paul		Date: March 8,2006	
Task	# cards to match	# cards correctly matched	Observation of student
Match picture word card/picture word card	6	6	Able to match picture word card with same picture word card easily on first attempt
Match picture word card/picture card	6	6	Does not seem to make much difference if word is there as he looks at the pictures
Match word card/picture card	6	3 with some assistance	Can not make much sense of the word in isolation, echoes the first sound of letter teacher assistant makes but can't match, can find the picture when the word is spoken to him
Match word card/word card	6	0	Cannot complete without the pictures

Similar to the activity above, the team created cue cards with sentences of approximately five words. Some sentence cards had one word inside a box to represent a picture card. Other sentence cards had the same word as a picture symbol card with the word. The team wanted to see if Paul could find the words and picture symbol card on his adapted keyboard. On the keyboard was an overlay or a sheet depicting different

words and picture symbols. Paul would first point to the cue card the teacher assistant held in her hand, then look for it on his keyboard to press. He created sentences that made a story. The results indicated that Paul seemed to find it easier to do the activity with the picture symbol cards than with just the words. Therefore, any stories that were created for Paul to type had a number of picture symbol cards along with different words.

Table 11

*Task Comparison Chart*

<b>Task Comparison Chart</b>			
Student:		Dates: March 6-10	
Task Outcome		Student points to word on cue card and finds same word on adapted keyboard with overlay which has words and pictures to press	
Data Method		Observe and record # of sentences correct out of ten sentences	
Person Responsible		Teacher assistant/Kelly Huck	
Task 1		Type one sentence without any picture cards in sentence	
Task 2		Type one sentence with a picture card in sentence	
Comparison	Sentence cue card with no picture word card without assistance	Sentence cue card with picture word card without assistance	Difference
Monday	1 of 5 sentences	2 of 5 sentences	Easier with picture cards to find on adapted keyboard, hard to do on own
Tuesday	1 of 5 sentences	2 of 5 sentences	Keeps reaching for teacher assistant hand to help him
Wednesday	2 of 5 sentences	3 of 5 sentences	Greater sense of frustration when trying to find word without picture
Thursday	2 of 5 sentences	4 of 5 sentences	Working more independently
Friday	2 of 5 sentences	4 of 5 sentences	Finding picture easier



Tim was responsible for writing many different tests in grade seven to check comprehension. Most of these tests were modified at the level that the content area was modified. Tim had trouble with retaining the facts that he was learning, staying focused during a test and writing out answers. Because his tests results were low, the team decided to use the scan and read program for assistance. The team decided to have Tim take these tests first with pen and paper. If he had trouble with the test, the teacher assistant scanned the test into the computer. The computer read the test to Tim and he typed in the answers. He then printed the test and handed it in. The results below indicated a great improvement in his marks. Tim told us that the computer helped him focus better and he liked to type the answers instead of writing them out.

Table 12

*Performance Data Chart*

<b>Performance Data</b>		
Task Outcome: Student takes one test by hand and the same test is scanned on the computer. The student will have the computer read the test and he will type the answers in.		
Data collected by: Kelly Huck		
Student: Tim		Date: Period of tests done in March/April
Task	% test done on paper	% test done on computer
Health test	48%	78%
Science test	40%	82%
Social Studies test	55%	85%
Power Point test	58%	87%
2 <sup>nd</sup> Health test	42%	81%
Rules - home and school test	Not done on paper	89%
2 <sup>nd</sup> Social Studies test	Not done on paper	83%

It is somewhat difficult to show data results of Tim remembering social rules or social situations, as data were anecdotal. If a situation such as wrestling with another

student at recess occurred, the consequence was that Tim was not allowed outside during the next recess. Tim's teacher assistant would sit down with him and together they would fill out a comic strip page and place it in his binder to go home. Parents would then be able to see it in the evening and talk to him about it. The team members would be informed of the behaviour and the team would monitor to see if the behaviour re-occurred.

The teacher assistant would keep a file at her desk in the classroom with a list of any behaviors we were watching for and record them if they happened again. Some behaviors only occurred once, such as an instance of hitting another student at recess, and others such as not putting his hand up before he spoke in the classroom were monitored more closely as this behavior occurred more often in the classroom. The following chart shows some of the behaviors the team watched for during the study. A social story intervention was developed in the form of either a power point presentation or Tim making a comic strip conversation page depicting the event. These social story interventions seemed to help Tim remember what the appropriate behavior was.

Table 13

*Classroom Observation Chart*

<b>Classroom/Hallway Observation of Student</b>		
Data collected by: Teacher Assistant		
Student: Tim		
Time period: data compiled over a five day period		
Task	# times behaviour occurred in a five day period before social story intervention	# times behaviour occurred in a five day period after social story intervention
Say “excuse me” if someone is in my way	1	10
Put my hand up when I need help in class	4	12
No running in the hallway	2	0
Ask for permission to leave the classroom	3	7
Not speaking when someone else is talking (not interrupting)	8	5
Make eye contact with the person I am speaking to	1	4

*Student Finished Work Projects*

*Paul:* Paul handed in completed stories to his teachers that were created with the talking word processor program. This was a fulfillment in his language arts class that the students complete a book report and then did an oral book talk to the class. Paul would complete the story using the computer in the LAT room with his TA. When he completed the story he would print the story he created. He would then present the story to his class using the talking word processor with the computer and projector. He would then sign his story with his first initial and hand the story to his teacher (see figure 1 for sample story).

This provided an opportunity to create curriculum objectives for the student that

matched those of the rest of the class. This allowed him to be included in the classroom language arts program in a capacity that previous to the inclusion of AT, he had not had access to. Although Paul may not have had awareness that he was being included in curriculum objectives, his parents certainly did, which, they felt, created a strong feeling of inclusion for their son.

How to make a hot dog.



open the bun.



put in the wiener.



put on pickles.



put on mustard.



put on onions.



put on ketchup.



yummy hot dog.

---

*Figure 1. Paul sample story*

*Tim:* What was of significance to this study was that Tim handed in assignments such as reports done on his computer for marking. He also handed in his PowerPoint™ social stories to be marked, which also included a presentation mark included in this. The social stories, which he did on Power Point™, were a great source of pride for Tim as he

used real pictures of himself and his friends. The added feature of being able to show his presentation gave him a greater sense of achievement, as well as valuable public speaking skills. Tim kept a comic strip conversation book (see Figure 2 for sample story) where he would create a story when necessary to remember important social rules. As it was kept in a book, Tim was able to take it home and explain it to his parents, thus reinforcing the skill and transferring it to other situations. Of special significance were the tests that he did on scan and read program. There was a marked improvement in tests that were completed by hand initially, then completed on the scan and read program. The tests were scanned on the computer then read back to the student with places marked for him to type the answers into. He could then have his answers read back to him to make sure they made sense. His marks improved over 50% with this program.

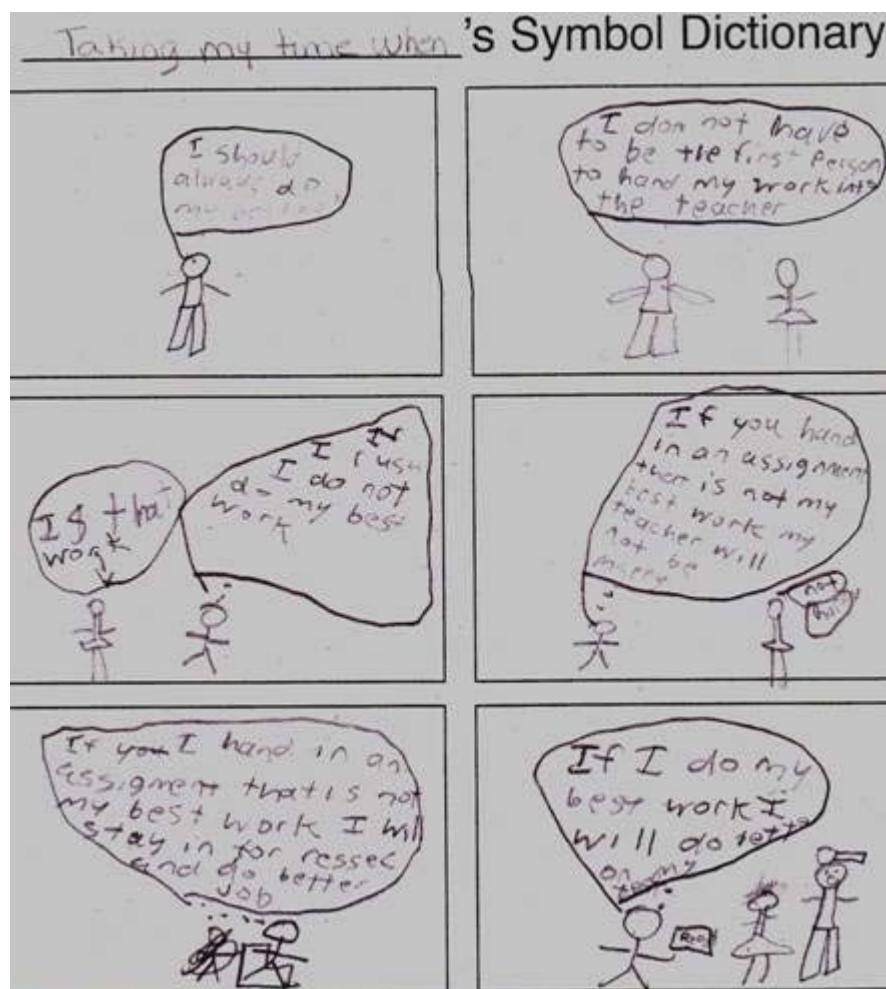


Figure 2. Tim sample story

### *Video Taped Presentations*

Videotaping was done in the classrooms strictly for instructional purposes.

Videotaping is allowed in the school setting when the parents agree to sign a media release form at the beginning of the school year. A participant's presentation was video taped when it was an expected component of the curriculum objectives. For example, the grade five classroom was expected to read a book, do a book report and present an oral book talk when completed. Because of access to a computer, digital projector and the

talking word program, Paul was able to participate fully in this curriculum objective. Paul copied a story onto the talking word program when working in language arts. When he completed his report, a copy was made for him that he could hand in and he was also able to do a class presentation on the story using the projector.

Paul showed his class a presentation on the story he made with the program called “How to make a hot dog”. Here is what his mother said after watching the class presentation:

*While I was watching Paul’s presentation I thought he has come a long way since beginning of grade five. He is so proud of his accomplishment on his work on the computer and being able to share it with follow classmates and staff and parents. It gives Paul the opportunity to be able to do his turn of book reports and to show the students what he is working on which is not all fun too. The presentation shows the adults the level he is working at. It also shows how the computer program helps him be able to comprehend and communicate better. I was unsure on the benefits of these presentations at first but am a strong supporter of them now-it is a great way of Paul being include in the classroom. By Paul’s reaction showing how proud he is of himself, this is proof that the presentations do make a difference (mother of participants, personal communication, April, 05, 2006).*

Tim was also able to make use of visual presentations by presenting his Power Point™ presentation in his health class as a component of the curriculum objectives. By doing these presentations, Tim not only became more comfortable in the classroom, he was able to learn valuable skills in public speaking. Because of the opportunities created with the social stories, the team was able to show Tim the video and discuss ways he could improve his presentations, such as facing the class and not always watching the screen. He also gained valuable computer literacy skills by learning how to make power point presentations, how to operate the digital projector, and how to use the digital camera and how to incorporate the pictures into the power point program.

The parents view on video presentations became apparent in their interview when they stated that by sharing with the class, the boys conveyed to their classmates the understanding that they were still working on their schoolwork, but just in a different form. The boys' sharing also helped their classmates understand that these AT supports, helped them understand the work and because this provision makes them understand it more clearly, then it should be offered.



## Chapter Five

### Analysis and Conclusions

#### *Discussion of Results*

In this chapter, research questions are analyzed. A sample list of the various devices and strategies that were used in this study are shown, and the outcomes are listed individually for each student. Personal comments are offered and reflections of events that were of special significance to the study are discussed. Conclusions drawn from this study finish the chapter.

#### *Analysis of Research Questions*

*The initial guiding question was how should technology goals be incorporated - as a separate section or as distinct goal?*

This was one of the most important prerequisite considerations and the most time consuming in the study. It was necessary to address this question prior to considering the research questions as it determines the context in which AT use will be assessed. In order for AT to work, the user must become proficient in the device before it can be used for purposes of embedding the technology into a strategy to help implement a functional goal.

AT goals can be incorporated both as a separate section when learning proficiency goals and doing trials with AT. Once learned, AT can be embedded into the curriculum goals as a strategy to support a goal. Through the trial periods of using the device, it became clear that if the device itself became a burden to the user, or viewed as

an extra step in achieving a goal, the device was not appropriate for the task. For example, before Paul could be expected to use the adapted keyboard and the talking word program on a regular basis in the classroom, he had to first become proficient first on his laptop, then on the adapted keyboard, then on the specific applications of the activities in the program.

These goals can be long-term goals that are created as SMART AT goals, which would become a SMART goal within the P3. The objectives to support the goal would be linked to the types of environments in which the device is tried and the type of functional task or routine in which the device is tried. The strategies, environments, personnel, and evaluation are also recorded. Once the student becomes proficient with the AT device, educators can decide how aspects of the program can be included as a strategy to support the learning goal or the SMART annual goal. The trial period, however long the team decides to trial, and how they determine whether proficiency is met, provides a structured way to see frustrations faced by all the team members including the student (see Table 9).

For example, when Paul used the talking word processor, his daily language arts time was spent in the learning assistance teachers' room on the computer, so that he could gain proficiency in the device and strategies. It was determined that the structure of the classroom setting was not conducive to training as the TA and LAT needed to help him learn how to become proficient with the AT. It would have been too noisy and distracting to do this in the classroom. The team determined that for this aspect of learning, Paul attended to the task much better outside the classroom while achieving the language arts goals. Changing the environment did not make it less inclusive as he achieved these goals in isolation.

Table 14

*Sample p3 page*

<b>COMMUNICATION</b>					
<u>Long Term SMART Goal:</u> Given visual and verbal prompts, Paul will ask for help 80% of the time, in specific tasks while working with his TA or with a small group twice in a day by the end of June.					
Objective/short term goal	Strategies/adaptive environment	Technology Accommodations Implementation Needed or in place	Material/ Types of Resource Needed or In place	Personnel Support: Teacher TA/LAT/ Peer, etc	Ongoing Evaluation: Observation/ Checklist, etc.
Paul will ask for help from his peers with both a verbal and visual prompt when given a picture to color while sitting with a class group in art class	Peer support TA assisted Picture communication cards	PEC card "I need help"	PEC cards Coloring picture	TA support Peer support Teacher and LAT to monitor skill	Checklist/ observation
<u>Long Term SMART AT Goal:</u> Paul will practice proficiency in using his alternative keyboard by typing words and sentences on his computer with 80% accuracy once ed day by the end of June.					
Objective/short term goal	Strategies/adaptive environment	Technology Accommodations Implementation Needed or in place	Material/ Types of Resource Needed or In place	Personnel Support: Teacher TA/LAT/ Peer, etc	Ongoing Evaluation: Observation/ Checklist, etc.
Paul will access his computer and keyboard in the LAT room once a day for a half hour period with assistance from his TA.  Paul will practice typing names of his family, and copying sentences from a book.	LAT support TA assisted  Story Books  Cue cards with names and sentences	Computer and adapted keyboard	LAT room  Storybook  Cue cards	TA support Teacher and LAT to monitor skill and assignment	Checklist/ observation

*Analysis of Research Question #1*

*How does the technology help facilitate the communication needs of the student with his peers? His teacher? His learning assistance teacher? His teacher assistants and other staff?*

**Paul:**

By having a buddy to read with, for recess partner, and communication exchanges with his talking tool, Paul was able to participate in meaningful ways with his peers.

1. By the end of the study Paul was consistently showing his work to the teacher. The team developed a card that said, "Show your work". When it was deemed necessary to hand in something, he was shown this card.
2. Paul consistently came to the LAT room to work on language arts with his TA. The LAT also trained Paul how to use most of the AT involved. Paul became very comfortable around the LAT and often wanted her to work on the AT with him.
3. Paul was placed in a position of having to communicate with staff members with communication cards and the switch device. This was reciprocal with the staff as they were also forced to communicate with him.

**Tim:**

1. Having peers recognize that it was acceptable for him to use AT in the classroom to support his learning did not require significant effort. Although viewed initially as somewhat of a novelty they wished they

could try, peers quickly became used to Tim using the computer in the classroom.

2. Many positive benefits came from his use of AT. Gaining a sense of ownership and self determination in social skills awareness, learning a new technology, improving organizational skills, being able to read better, staying on the same topics with peers, and learning how to get up in front of the classroom to make a presentation were all outcomes of using AT as an extension of his learning environment.
3. Spending more time with the LAT and TA on social skills learning, and focused learning time with TA and teacher on comic strip conversations were benefits of AT use. Having the student explain to the teacher why a situation happened and what it may look like in the future was also a positive aspect of AT use.

### *Analysis of Research Question #2*

*How does the assistive technology affect both the pragmatic social application of communication and the communication competency of the student? What are the differences in the application and results?*

Pragmatic social application of communication refers to knowing how to use language to communicate in different situations. This means knowing what to say and when to say it in social exchanges and conversations. Communication competence is the ability to communicate functionally in the natural environment to meet daily communication needs.

**Paul:** In terms of pragmatics, Paul participated in social exchanges to the extent that he was learning turn taking and waiting throughout the year in different activities. When he used the talking tool to share a book with a partner, the partner read a page, and then Paul used his talking tool to read a page. Using this device helped him learn to wait his turn and how to share in a communication exchange with a partner.

In terms of communication competence, Paul used the PECS cards daily to functionally communicate needs and wants with others. He was able to see this year how he could also use these cards to learn vocabulary words and how his picture cards could be transferred into a different learning environment, such as incorporating them in a story form. Throughout this year however, we did not see much growth in the area of development of initiating skills through PECS. This is something that requires continuous training for him and his school team.

**Tim:** Pragmatic communication was an area of growth for him. Tim had limited previous experience with social stories but found them somewhat childish. The ability to transfer learning social skills to Power Point <sup>TM</sup> presentations with life like pictures of him in given social situations we were teaching enabled the skills he was learning to be connected to real life situations. With this experience, Tim was able to reflect on having a visual picture in his mind about the skill. The comic strip conversations provided growth for Tim in this area. Because of how they are made, including the visual aspects and talking about the situation after making the comic strip, the strips enhanced retention of how to act in a given situation.

For the most part, communication competence was not as significant for Tim as was the area of pragmatics. Tim was competent in functional communication on a daily

basis with the help of his TA. He sometimes had difficulty understanding what rules govern behavior and certain social norms. However, the school team has committed time to teach Tim how to ask the appropriate questions when he is unclear about his understanding of different concepts.

### *Analysis of Research Question #3*

*What is the impact of having the carry over of the assistive technology devices and applications/objective/goals to the students' home? Does it affect the way the students' communicate with their parents? With the school?*

The home environment benefited because the parents were an important factor in the implementation process. Paul has a detailed communication book form that includes before, during, and after school observations, and communication with peers. The team distinguished between negative behaviors Paul could control (when he was not getting his way) to negative behavior Paul could not control (when we felt it was related to autistic or seizure behavior).

The key factor of consideration was that the parents were able to take the equipment home every night, thus, encouraging generalization and transfer of skills. There was daily communication with the school because one parent came to the school every day to pick up Paul. They were also kept abreast of changes to the boys' schedules, had first hand experience watching the boys work with their AT and knew what the objectives were. Parents did the same thing the school did with the AT trials. Parents shared what they were doing at home and any questions they had.

#### *Analysis of Research Question #4*

*What is the overall effect of using assistive technology in the classroom? Does the use of the device(s) help make the classroom environment more inclusive or less inclusive? Is it dependent on the type and how it is used in the classroom?*

In both Paul and Tim's cases, the ability to do presentation on work they had been doing outside the classroom gave both boys a sense of accomplishment. I do not believe that there would be as much of a sense of self-achievement for either boy if these factors were not present.

Paul used the switch device to participate in some group or partner activities, which made it more inclusive in the sense of providing greater interaction with his peer groups. For Tim, initially using the laptop to take notes in class caused some feelings of envy on the part of his peers. After he used the technology more often in the classroom, his peers became accustomed to him using it. Overall, the use of the devices made the class environment more inclusive. It appears that the more devices and strategies educators will be able to use in the future, the more normal it will seem to students, and the inclusivity of the classes will increase.

The devices and strategies became inclusive if they were not considered a barrier to support in the environment. For example, Tim's use of the pocket computer was viewed as a novelty at first. He enjoyed playing with it and saving things in the calendar function. However, every student in his classroom uses a daily planner. Tim also used a daily planner. Therefore, he ended up putting the same information such as homework assignments, upcoming projects, and events into two places (the daily planner and the pocket computer calendar). After two months of attempting to use both, use of planning



in the pocket computer was withdrawn in favor of using the daily planner like everyone else in the classroom.

Below are tables that show some of the applications of specific AT devices and strategies for each student. The chart also examines both the anticipated outcomes and the description of the outcome. The team was able to use both some of the pre-determined AT devices mentioned in the introduction, such as the pocket computer, laptop, and some of the software. Particular strategies worked well, and other strategies were abandoned. Other strategies such as the use of comic strip conversations, and the use of a simple switch device to facilitate communication with Paul and staff members were ideas that were formed during the course of the study which were not pre-determined in the fall.

Table 15

*Sample of Paul's AT use*

<b>Description of major AT strategy and procedure</b>	<b>Anticipated outcome</b>	<b>Description of outcome of strategy</b>
Introduction of both a new talking word processor program, and an adapted keyboard to be integrated into Paul's personal program plan.	<p>Paul will gain proficiency in using an adapted keyboard and the talking word processor and it's applications of the program.</p> <p>Using the talking word processor to retell a story for book talk in classroom.</p> <p>Presenting the story with projector and the program and handing the story into the teacher</p>	<p>Paul used the adapted keyboard everyday for a half hour in the special education room to practice typing words that were on cue cards and copying the letters onto the computer to make words.</p> <p>Paul used the talking word processor program by typing sentences from a simple book onto the computer to show him how words can be combined to make sentences. He learned how to make spaces between words and that a period at the end of a sentence meant the sentence was finished.</p>

<p>To extend Paul's use of communication cards by using them to learn new vocabulary words related to stories</p> <p>Use of a single switch voice output system to allow Paul to read with a buddy.</p>	<p>Symbol cards with a picture and its name related to specific words in books that related to the stories he was typing were made and cut out so he could practice typing them on the computer and matching them in a book.</p> <p>Paul will learn to both interact with a partner and practice turn taking skills by using the switch in a functional task.</p>	<p>Paul was able to copy all the sentences from a book with both sentences and pictures by typing them onto his keyboard. He was able to play back the story so he could listen to it and it was also used to present the story to his classroom.</p> <p>Paul was able to relate to relate the words better in the book he was reading because he was able to match the symbols much easier.</p> <p>Paul used his switch by having every other page in a book pre-recorded so that when with another student, he could read a page, then his partner would read a page. He quickly learned this skill and it was used twice a week.</p>
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Table 16

*Sample of Tim's AT use*

<b>Description of major AT strategy and procedure</b>	<b>Anticipated outcome</b>	<b>Description of outcome of strategy</b>
<p>Tim will practice proficiency in learning how to use read and scan software on the computer.</p>	<p>Test Taking: Upon undertaking a test by hand, waiting for a period and then taking the same test on scan and read program, the student will be able to understand the content better and with this understanding be able score higher on the tests in Social and Health.</p> <p>Tim will use this software to</p>	<p>Out of five tests in subject areas of science, social and health, Tim's average score taking the tests by hand was 48%. After a waiting period, and taking the same tests scanned and read to him, his average score was 85%. Two tests, which were given by read/scan alone, scored as an average score of 78%.</p> <p>Tim used this program with a small</p>

<p>Using calendar function on a pocket computer for homework reminders and keep track of assignments</p>	<p>scan novels onto the program so that he can read class novels and also use it for his take home reading.</p> <p>Tim will use the calendar function to record events happening within the month. The computer will then remind Tim of events that are on the day, as the event will pop up on the menu for that day. This will aid in remembering and keeping track of important information.</p> <p>Tim learned to write comic strips to help him understand situations where is got into trouble or had problems remembering social rules of behaviour.</p>	<p>group of students in his class who could be pulled from class to have the story read to them and answer questions on the computer. They were able to work on the same novel as the rest of the classroom this way. They enjoyed the experience and achieved better understanding and retention of the material.</p> <p>In addition to recording by hand in a classroom calendar book, this function was over excessive, because it became more of a burden to do it twice. It was used for three months. It was abandoned and the in favour of the calendar book.</p> <p>Tim was very successful with these stories. His TA assisted him with writing them. He then explained the situation to his teacher or LAT. He was able to remember the story and not repeat the situation 80% of the time given six different situations in the school.</p>
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### *On a Personal Note*

As I reflect on my own involvement of this study as an embedded researcher practitioner, I found the task sometimes overwhelming. I had a responsibility to my study but also to the rest of my assignment as a practitioner. It was often hard to juggle the time necessary to fit everything in my schedule. I found I did not have as much time to plan with teachers in some of my other classrooms, but found them understanding in my time restraints. I do not believe I would have received data as rich had I not been immersed in the process. Everyone involved in the team felt comfortable with each other and communicated well with each other. Members of the team were reliant on me as the

person most knowledgeable about the AT process and would therefore seek me out regularly to ask questions. I feel that based on my involvement with this study, it is very important that a member of the team at the school level have the knowledge of the implementation process but also be trained properly to fix a problem with hardware or software, or know who to access in the division for support.

On the same note as the other team members, I found many challenges with time. One challenge was to find time to meet regularly with team members. Meetings were disjointed, with not all team members being present at all meetings. In addition to our regularly scheduled school team meetings which happened less often than once a month, I would often meet with parents to discuss strategies, or consider a new strategy. This was also the same with the teacher and TAs. I had individual meetings with my special education consultant at least once a month to consider ideas with her on programming issues. It was useful to have meetings in this way to inform the other team members of choices I wanted to make, and I found it was less time consuming to meet with individuals, as some discussion items did not pertain to all group members.

When I reflected on the data from the questionnaires, it became clear to me that time was a prevailing factor in successful planning and implementation. Some TA's had great suggestions, such as spending a day together to learn. Unfortunately, this is not always possible given the time restraints and costs involved. I think team members must be willing to be flexible in their own time as well. This becomes dependent on the level of commitment and desire of the team members. In my view, people are only willing to give up their personal time for things they feel passionate about.

The success of AT devices and strategies seemed dependent on the type of

environment chosen, the type of task and the tool that was used. Paul was successful in learning to use the computer in the special education room because it was not noisy.

Tim's TA thought it may have been more beneficial if the computer was in his classroom instead of another room. I also found that once team members were familiar with devices, it was much easier to implement strategies.

I also felt a strong connection to the family. Working closely with the family, I recognized the different perspective of the family, compared to the perspective of the educators. An administrator I know has a special needs adult and once commented that we should always remember that the teacher, special educator, and TA are the child's caregivers for only six hours a day. Their parents are responsible for them twenty-four hours a day, seven days a week. They not only worry about their children's, education but also their future outside school, and their hopes and dreams. I believe that as educators, we do not have the right to judge them if their priorities sometimes seem different than ours.

As a special education teacher, I found the extra time spent with the participants, observing, training or teaching very valuable. A stronger sense of trust between the participants and me was formed. They displayed a willingness to come and ask me for help when it was needed. I tried to keep my role in their lives this year with some boundaries; I was viewed as the person who helped with technology inclusion mainly. I would do programming with the TA's regularly, which they would conduct outside my room or inside my room depending on the activity. Paul came to my room daily to do work on the computer and Tim would come, usually with a partner to work on Power Point™ slides, social skills lessons, test taking, and scan and read talking books.

*Of Special Interest in Findings*

Paul worked on a selected set of pre-programmed talking word processor activities found within the program on his laptop everyday in the special education room. A way in which the school team felt the program could be more inclusive was to try to incorporate story creation as an extension of language arts so that he could participate more in the class activities. As part of the language arts program, the teacher decided to include oral book talks as part of her evaluation process. Upon completion of reading a book and writing the book report, the student would make a presentation to the class on what he read. Paul was able to participate in this event four times during the course of the study.

Initially, an alternative keyboard was used to teach Paul to spell his name and other names of his family members on the computer, which spoke the names back to him. This process evolved into:

1. using the alternative keyboard to copy and type words into the program which spoke the names back to him;
2. using the keyboard and recipe cards to type the words to a simple story with sentences to re-type the story;
3. using words and symbols to re-create the sentences of the story being read and creating a new talking story which could then be read back to the student;
4. using the picture/word symbols as a way to teach new vocabulary words to the student;

5. using the newly created story to use as a book talk, which could be presented to his classroom.

Results indicated that after his first attempt, reading the stories seemed to get easier for him. His tracking skills became better and he was able type the words on cards to the story and to re-create the story independently without hand over hand movement. It took him approximately two weeks of regular practice to type the story independently

As the results indicated, Paul seemed to have awareness that words can be connected to create a sentence. It is unclear if he understood what he was reading, however, he seems to enjoy the experience of making the letters to create words and of using words and symbols to create sentences. He liked to play the story back to listen to it repeatedly.

Pat Mirenda believes that it is becoming clear that students with autism benefit from literacy instruction that uses multiple instructional strategies, and which matches the student's stage of reading development (Mirenda, 2003). As it is very difficult for students with autism to learn words phonetically, the use of picture symbols is often used predominately to teach. In Paul's case, new vocabulary words that were made from stories he was using with talking word program. Using a match show tell procedure helps determine if the student is able to understand the words he is using. Using this strategy, Paul was able to show the picture word when asked with 100% per cent accuracy. When he attempted to match the word in isolation to the picture, this accuracy rate was cut in half. Paul still has much to learn. It is hoped that the continuation of this strategy in conjunction to story building will help in his acquisition of reading skills. It is

unclear at this point whether Paul will ever gain the skills to read phonetically to the point that he could use a keyboard independently to type words he wants to say. We will continue to work towards this goal.

In Tim's case, working with PowerPoint™ presentations and comic strip conversations was a way to increase his pragmatic skills powerfully, especially in his ability to retain these skills and generalize them into novel situations. This took time and practice both on the part of the family and the staff supporters. Tim was either able to figure out what was wrong in a situation, or was able to stop himself before he made an error in judgment, such as not talking out of turn in the classroom ,80% of the time. He will need continued guidance in this area. The school team has decided to focus on making a series of conditional (if-then) statements with various social and non-social rules on cards that are easily accessible for him to view. The team continues to use the comic strip conversation sheets, which are placed in a binder in his desk for easy access.

### *Conclusions Drawn from Study*

This was a small study with two participants in a school setting. Because of the confined nature of the study, broad conclusions cannot be drawn from the data. The study participants have both been diagnosed with autism, each with varying degrees. Every child with autism has very different symptoms. I cannot generalize that another child with autism who displays similar symptoms, as either participant would react in the same way in any of the given situations.



It appeared that Paul was able to learn to use his picture communication symbols in a learning environment. He was able to match picture symbols only if the picture was present. He could not match words with words. This data showed us the extent that he relies on his picture communication symbols.

Tim had great success in writing tests. One conclusion that can be drawn is that scan and read programs can be successfully used for test taking. Data indicated that when Tim wrote his tests on the computer, his marks showed a significant improvement. His ability to retain the information and clarify his thoughts on paper was evident in the marks he received.

Other data compiled in this study showed the team how these two students reacted in different contexts. This data helped guide decisions about goals and objectives in the students' programming. Our school team worked very closely together and had daily contact with parents. We had two students that were receptive to learning in different environments. All these conditions will not be the same in a different situation. The team relied on a framework to guide our planning and implementation, not to generalize results from the framework.

### *Extensions for Research*

This study spawned questions for future investigation, which can be considered outgrowths of this study. There were two specific areas of significance to the findings. Because this study was conducted in the school where I teach, I have the luxury of paying

close attention to areas that the team found very beneficial to student learning. The team can then revisit these findings this fall when school begins.

Paul was beginning to be proficient with the talking word program. The school team will continue expanding, documenting, and revising Paul's attempts to build stories with the talking word processor program. It is hoped that Paul will progress from typing with assistance to typing independently through the use of augmentative communication.

The team will also pay close attention to raising Tim's awareness of social rules and norms. This is particularly important to consider, as this is his final year in elementary school. The team will monitor Tim's use of social rule cards to determine the effectiveness of retaining social skills concepts. Because of the success of visual supports with Tim, the team needs to explore other areas where power point skills could be used as a visual support in other domains of learning, as it is apparent that visual strategies work well with Tim.

## Chapter Six

### Conclusion and Commentary

In this final chapter, a conclusion to the study is given. Following this is my commentary about issues I feel are relevant, based on my own involvement in this study.

#### *Conclusion*

Technology will continue to have an important role to play in school systems. Our special needs population and inclusion practices are also growing, as is the need for greater access awareness and training in AT. These issues were the foundation of this present study. I found that AT was something of greater interest to explore because of a lack of direction in this area in the schools I had worked in or had knowledge about.

Having completed this study and having had subsequent conversation with others in my field, I notice the lack of knowledge about AT and AT training. The results of this study indicate that the outcomes of AT devices and strategies proved to be successful motivators for both participants in terms of self-determination, inclusion, communication practices, and learning in this context.

As the study evolved, a way of thinking among team members evolved as well on how various aspects of AT could support the participants in their learning. Team members actively searched for better ways to improve the boys' learning, looked closer at the objectives we were attempting to achieve and the how we could match AT goals with them. This evolving process is consistent with case study research. The research

questions prompted a questioning of how to improve practice.

There are obvious barriers involved in the AT process in this context. A consistent theme in the study was the lack of time to implement, train, update, and meet with the school team. There are specific ways to improve the process that this school team went through which were discussed and which will be considered in the fall. As mentioned at the beginning of the paper, this was a journey taken in AT. A journey explored both by the family and the school team member. Already, the team was deciding on ways to expand objectives taught and achieved within the AT process for the upcoming school year.

Having spent the past year incorporating AT into a structured implementation process, the team has discovered that there is much uncertainty and that one must have full cooperation of all team members. The team must always be focused on what they are trying to achieve for the student and how the student needs are being met. Always going back to the learning objectives was a way the team kept focused on the task.

I am an advocate for the parents. I think in order for AT to work and to work well for the student, the families of the AT users must be supportive and must also receive support from the school. They must be given the appropriate skills to operate the devices and they must help themselves by keeping up to date with the technology. This connection between the home and school is a key factor in whether the individual becomes a life long user of AT, as those involved in the AT process will face the barriers of mixed attitudes, lack of knowledge or awareness, and lack of time and support. Parents need to take as much of an active interest as possible as they are the strongest advocates for their children.

In closing, this study was a wonderful way to experience the AT implementation process. Fortunately for our team, all members kept an active interest in and focus on the process. Because of my dual role, I was kept completely immersed in the process from start to finish. Having the extra time to spend with the students gave greater insight into the thought processes of the student participants, which was a valuable learning experience as a special education teacher. It was a good way to experience first hand the frustrations the team faced, and it was a valuable way to see the joy the devices and strategies brought to the students and their family.

### *Commentary*

*Disclaimer:* The following commentary is based on my opinion. These opinions are not drawn from the findings of this study. Rather, they are based on my own experience and attitude as an educator and a researcher. I feel that it is important to elaborate on ideas and suggestions that I have learned from this experience, but I caution the reader that the commentary goes beyond the confines of this study.

The area of AT has received considerable attention in the research literature, but attention should be given to grounding new theory in practice. Much can be learned from close examination of the lived experiences of educators, students and parents who employ AT. Development of models and theory around AT adoption, implementation and evaluation need to be considered both provincially and locally to ensure amalgamation of current best practice and provincial and local goals and initiatives.

*Commentary on Suggestions for the Practitioner*

In my opinion, school divisions in Saskatchewan need to examine best practices in AT use and implementation. As previously mentioned Saskatchewan Learning is in the process of piloting AT policies and practices in the fall of 2006. As a researcher who has undertaken this process this past year, I developed the following list of considerations that school divisions should be aware of in terms of the AT implementation process.

1. School divisions should pay close attention to the Quality indicators in the AT process and use them as a guide for the implementation process.
2. School divisions should recognize that a framework needs to be followed, paying close attention to the current directives of the province (i.e., SMART goals).
3. School divisions should recognize the need for not only a person in the division that has a knowledge of various types of AT, from simple to complex, but also who has the ability to learn and then teach/train various school teams how to use the acquired equipment. Although this person may be someone outside the system who is able to consult and train, it may be more feasible to have such a person inside the division who is accessible to employees.
4. School divisions should recognize the need for an AT consultant or AT teacher who can help school teams in the initial stages of recommendations, team planning, set up, and implementation. Also, this person should be available for follow up visits with school teams to help

re-evaluate the process, to help make appropriate changes, to ensure proper training has taken place, etc.

5. School divisions should recognize the need for in-servicing their employees who work with the special needs population in the school, including principals, teachers, and teacher assistants. This should occur in order to bring awareness of the types of AT available, of ideas for implementing software products, of types of AT devices, of trials which were successful and those which were not.
6. There is a need provincially and locally to recognize the possibility of having pre-service teachers obtaining the background knowledge of AT background, implementation processes, and models that could be learned as part of a course at university. School divisions should also be aware of the importance of training for in-service teachers.
7. There is a need for school teams to recognize that: the AT inclusion process is time consuming; it may have many frustrations; it requires excellent communication with the school team (parent, child, teachers, teacher assistants, outside agencies, etc); and that is has many trial and errors. School teams therefore, need to make allowances and have provisions in place to accommodate the needs created by these areas of concern.
8. School teams need to be people centred. . Although it may sometimes look like it is not worth the effort to go through the AT inclusion process, the benefits to the student far outweigh the potential drawbacks school teams

may face. School teams must always focus on the goals of the student and the potential benefits for the students involved.

9. School divisions should make teaching staff aware of the availability of low technology strategies and simple devices that involve low costs and which may not require tech aid requests.
10. School divisions should recognize a need for a type of loan system, where various costly high tech devices such as an augmented communication device are located in a central area. When a school team decides to acquire an AT device, the team would borrow the specific device, receive the initial training for set up, have a trial period with the device, meet with the AT consultant/teacher to review the results of the trial, then purchase or rent the said device. If the device is medium or low tech, the team may decide to simply purchase the device before having a trial, provided that the device is deemed worthwhile to the student, a plan is in place for the use of the device and the student has the capability of using the device.



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## Appendices

### Appendix A: Ethics Documentation

Sample letter of consent to participate in research

Sample Paul permission to participate

Sample Tim permission to participate

School Division sample letter to conduct research

### Appendix B: Parent questionnaire

### Appendix C: Parent Feedback on AT form (Alberta Learning, 2006)

### Appendix D: Teacher/teacher assistant questionnaire

### Appendix E: Assistive Technology Internet Websites

## Appendix A: Ethics Documentation

### *Sample letter of Consent for Participation in Research*

**Title of Study:** A Case Study of One Family's Experience with Assistive Technology

**Purpose of Study:** This study will involve two autistic brothers who are designed special needs students of whom I currently work with in my capacity of learning assistance teacher at Bishop Roborecki School and their family.

**Procedures of Study:** With your approval, assistive technology will be incorporated into the students' personal program plans. From this, goals will be set, facilitating technology enhancement in the domains of reading, writing, math, designing, and expressive and receptive communication. Goals will be evaluated to determine effectiveness and strengths and weaknesses and their impact on your child's environment in the classroom. I will also request your assistance in learning about the new technology in place, helping set goals for your children and helping monitor the comfort level of your child's use of the technology supporting each child's personal program plan. Monthly scheduled meeting will take place with all team members including parent, student, teacher, teacher assistant, and learning assistance teacher and outside agencies to review goals and ensure comfort level of each participant.

In addition to comments made on your child's personal program plan, I will also keep anecdotal records such as observation records, checklists and field notes. No direct quotes from students shall be used; however, their opinions of each device will be noted. Monthly scheduled meeting will take place with all team members including parent, student, teacher, teacher assistant, and learning assistance teacher to ensure no undo pressure is being placed on your child to continue working with any device. As daily contact is current with home and school, at any time you feel your child is feeling anxiety in anything involved in the study you are welcome to speak to any of the team members.

**Risks of Study:** There is a very minimum risk in maintaining anonymity of the participants as the school will be know and readers may be able to deduce who the participants are. Also, readers may know the researcher and know where she works. As the technology goals will be incorporated into the existing program plan with your input and approval, minimal risk is placed on your children to do a great deal of extra work in their current learning. Although both you and your children share a dependent relationship with myself in my capacity as a learning assistance teacher, procedures have been set up with the principal that you are able to talk to any member of the team or the principal if at anytime you feel your children are at risk in any way through the duration of this study. I will share all anecdotal records and all information within the personal program plan of your student with you throughout our monthly meetings. I will use pseudonyms in the transcriptions and final report to ensure anonymity. I will also ask you to sign a letter of consent for release of transcripts. I will give you a copy of the results at the end of the study.

**Storage of Data:** The data collected from your child will be kept at a secure place at the University of Saskatchewan, Department of Curriculum Studies – Communications and Technology with Dr. Richard Schwier for five years according to the University of Saskatchewan guidelines.

**Withdrawal:** You may have your child withdraw at any time during this study. This withdraw will in no way affect your child's academic status, continuation of all services provided at the school and public agencies such as the University, hospital, social services, counselling services, occupational therapist and speech and language services. If you decide to have your child withdraw, all transcripts of anecdotal records will be destroyed and the assistive technology section of your child's program plan will be destroyed.

**Dissemination of Results:** The results of this study will be used for a thesis in partial completion for a Master's Degree in Education Communications and Technology. Later, it may be published as an article in a scholarly journal or used for a presentation or conference.

If you have any questions about your child's participation or your child's rights as a participant in this study, you may contact Office of Research Services at the University of Saskatchewan (966-2084); or you can contact me, Kelly Huck (653-2452); or my advisor, Dr. Richard Schwier, Department of Communications and Technology (966-7641).

I, \_\_\_\_\_, give consent for my child, \_\_\_\_\_ to participate in this study. I understand that this research project was reviewed and has been approved by the University of Saskatchewan Behavioural Research Ethics Board on \_\_\_\_\_. I am aware of the nature of the study and understand what is expected of my child and myself. I have a clear understanding of the risks of the study as outlined in the parent approval letter. I understand that I may have my child withdraw at any time during this study without loss of services to my child. A copy of this form has been given to me and I will receive a final report at the end of this study.

\_\_\_\_\_  
(Parent Consent Signature)

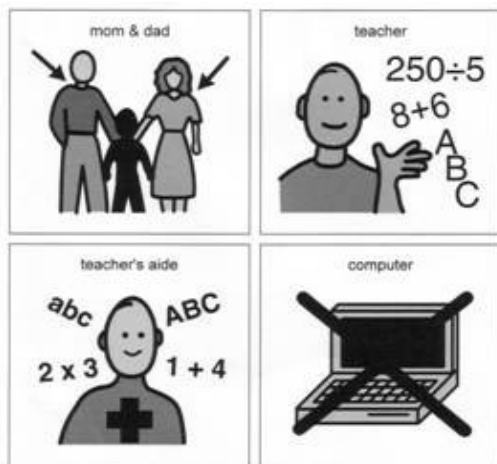
\_\_\_\_\_  
(Child Name)

\_\_\_\_\_  
(Date)

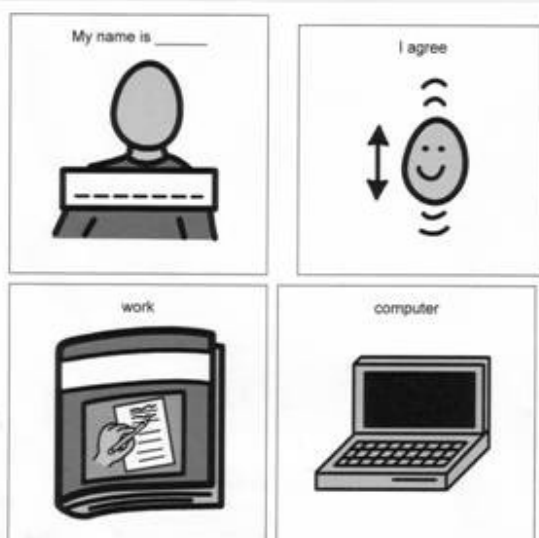
\_\_\_\_\_  
(Researcher Signature)



*Sample Paul Permission to Participate*

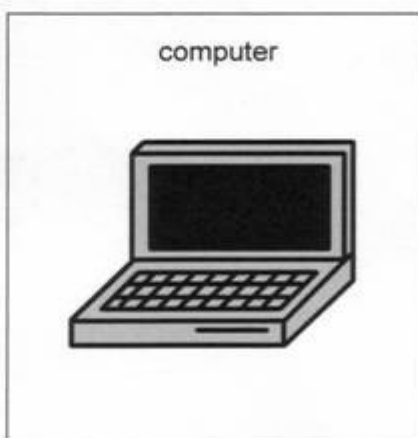
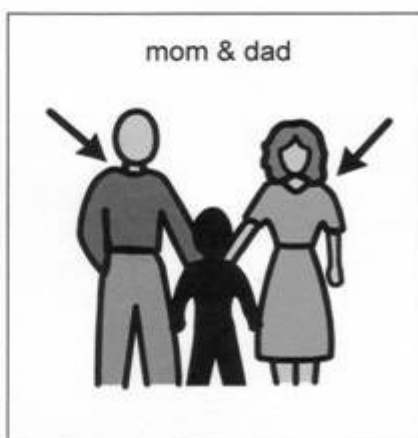
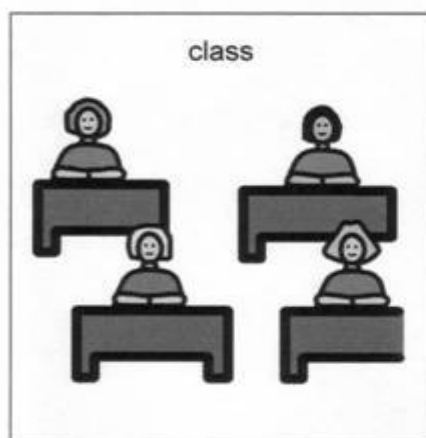


I can tell mom and dad or my teacher or teacher aide if I do not want to work on the computer anymore.



When I sign my name here it means that I agree to do some of my work on the computer when it is special activity time.

*Sample Tim Permission to participate*



I will show the class and mom  
and dad the work I am  
doing on the computer.

*Sample School Division Letter to Conduct Research*

Dear Superintendent of Research,

Please consider this my request to carry out my research project, “A Case Study of One Family’s Experience with Assistive Technology.” This study will take an introspective look at two autistic brothers, one non-verbal, one higher functioning, and their use of assistive technology to enhance their communication needs

This study will involve two autistic brothers who are designed special needs students of whom I currently work with in my capacity of learning assistance teacher at Bishop Roborecki School and their family. With their parents’ approval, assistive technology will be incorporated into the students’ personal program plans. From this, goals will be set, facilitating technology enhancement in the domains of reading, writing, math, designing and expressive and receptive communication. Goals will be evaluated to determine effectiveness and strengths and weaknesses. Monthly scheduled meeting will take place with all team members including parent, student, teacher, teacher assistant, and learning assistance teacher and outside agencies.

I will take great care to ensure the preservation of privacy and confidentiality of all participants and will only ask them to participate on a voluntary basis. Participants and their family will be made aware of the purpose of the study and will have the option of withdrawing from the study if they chose.

The participant’s family will be provided with a copy of their data, checklists, observations and a copy of the results of the study. These results will be used for my thesis, and may later be published in a scholarly journal, used for a presentation or at a conference.

I ask you cooperation by allowing me access to these individuals by confirming and signing this form and if possible, supporting this study to the families involved. Thank-you for your support.

---

Kelly Huck  
Researcher  
University of Saskatchewan

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Superintendent of Research

---

Date

## Appendix B: Parent Questionnaire

### *Questionnaire for parents regarding technology:*

1. What types of communication tools or activities do you use at home that is not being used at school?
2. What types of communication tools or activities have you used at home that have been introduced at school and you are following through with them at home?
3. What communication tool or aid that has been introduced this past year at school that you have found to have the most benefit for Paul? Tim?
4. What communication tool or aid that you use at home do you find to be the most beneficial in terms of communication for Paul? Tim?
5. Have you seen a successful transition between home and school with the laptop computer for Paul? Tim?
6. How has using the laptop been beneficial for Paul? For Tim?
7. How has using the scan and read software been beneficial for Paul? For Tim?
8. How has using the talking word processor program been successful for Paul?
9. How has using the pocket pc been beneficial for Michael? How has the step by step been beneficial for Matthew?
10. Do you feel there has been adequate training for the above technology for the boys? For the parents?
11. Do you feel there has been good follow through between home and school in terms of doing assignments on the computer for Paul? For Tim?
12. Do you feel that there has been adequate home and school communication between home and school?
13. What things has the school not done with existing technology that you would like to see this year put in place?
14. Do you feel that there has been too much technology introduced and that the boys feel in any way threatened or overwhelmed by the technology?
15. What is the most surprising thing that you have found with either boys in terms of their progress or learning with the technology this year?
16. Do you feel that this direction of using technology to enhance communication skills is the right approach for the boys? Do you feel another approach may be better – by not using the technology or less of it?
17. Overall, in terms of technology would you say that you are happy with the outcomes, upset with the outcome, overwhelmed, surprised or elated with the increased involvement of technology in either of your children's education?
18. The inclusion of technology is meant to be an extension of student learning or as a strategy to enhance learning. Do you think that the school has done its job in incorporating technology into curriculum and/or program plan objectives or does it feel more like we are using technology as an extra feature or extra work?
19. Are you comfortable and do you feel it a necessary part in the inclusion of technology process that both of the boys participate in some form of presenting their work to the rest of their class? (With Paul showing how the talking word processor program works) (With Tim doing power point presentations)?

*Personal questions for parents:*

1. Is Tim aware that he has a disability?
2. Have you ever spoken to him about how he make not think the same way about some things like other kids his age or how he might need to have things repeated to him to understand better?
3. Does Tim ever talk about feeling different from other kids?
4. Do you think that he feels that he is treated differently by his actions or thoughts?
5. Do you think that Tim feels more included or less included by his peers through
  - a. His use of technology supports
  - b. His time spent with Mrs. Huck
  - c. His time that he spends getting help from a TA
  - d. Having to sometimes do different types of work?
6. To your knowledge is there any family history of autism in either parent family history?
7. How old was Paul/Tim when you first thought that each child may have a developmental disorder?
8. How has Paul/Tim's language development patterns differed from the expected milestones for children?
9. You have worked with different agencies including the school to support your family with your children's disabilities. Are there any forms of support that you have found to be more beneficial than others?
10. What is the general health of your children?
11. What school modifications or accommodations have been necessary for you children to succeed not including the technology put in place for them?
12. Are there specific vacations or recreational activities that have worked out well for your family? For example, family trips, children camps, etc.
13. Can you describe the family stressors that have been the most difficult for your family? For example, having to keep up to current research on disabilities, sacrifice of personal or professional goals?
14. Do you feel that having children with disabilities limited your family size?
15. Can you describe any specific teacher characteristics that have proven to by the most successful for your children?
16. Can you describe any teacher reactions to having a child with autism within their classroom without naming the person?
17. Can you describe any reactions of classmates to having a child with autism within the classroom?
18. What are your concerns for each of your children when being placed within the structure of a high school?
19. What are your thoughts, issues, or comments on inclusive education?

## Appendix C: Parent Feedback on AT (Alberta Learning, 2006)

### *Parent Feedback on Assistive Technology for Learning*

1. Changes in my child's performance since using assistive technology for learning:
2. Changes in how my child feels about using assistive technology for learning:
3. Benefits of the assistive technology for learning use:
4. Drawbacks of the assistive technology for learning use:
5. Other places and situations in which this assistive technology for learning might be useful:
6. Things I want to share with the team:
7. My thoughts and feelings:
8. Supporting evidence or data:
9. My questions for the team:

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Note. This appendix adapted from Penny Reed and Gayl Bowser, *Assistive Technology Pointers for Parents* (Winchester, Or.: Coalition for Assistive Technology in Oregon, 2000), p. 39.

[www.edtechpoints.org](http://www.edtechpoints.org)

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## Appendix D: Teacher/Teacher Assistant Questionnaire

### *Questionnaire – Assistive Technology – Teacher Assistants and Teachers*

1. How does (did) each of the following technological devices or strategies support the communication needs of the student you worked with?
  - the talking word processor program
  - the step-by-step switch device
  - the talking tool
  - social stories
  - PECS cards
  - being with a buddy
  - class presentations
2. How did the student's performance improve or change when these devices were tried in the classroom?
3. Do you think the student:
  - liked to use the device?
  - preferred one over the other?
4. Did you notice if one device was more effective over another in terms of helping meet the communication needs of the student?
5. What do you think the advantages are of using assistive technology in the classroom?
6. What do you think the disadvantages are of using assistive technology in the classroom?
7. What personal frustrations or satisfaction have you experienced in:
  - helping the student use the technology?
  - learning how to use the technology yourself?
  - having adequate time to learn each new device?
  - feeling comfortable using the technology?
  - adequate support with the use of the device in the classroom setting from teacher, LAT?

## Appendix E: Assistive Technology Internet Websites

### Sample Frameworks

Alberta Learning

Individualized Program Planning. Chapter 9: Infusing Assistive Technology for Learning into the IPP process.

[http://education.gov.ab.ca/k\\_12/specialneeds/ipp.pdf](http://education.gov.ab.ca/k_12/specialneeds/ipp.pdf)

Georgia Project on Assistive Technology, Georgia Department of Education

<http://www.gpat.org>

Joy Zabala's Resources for Assistive Technology in Education

[www.joyzabala.com/](http://www.joyzabala.com/)

National Assistive Technology Research Institute, University of Kentucky

<http://natri.uky.edu/>

Oregon Technology Access Program, Oregon State Department of Education

<http://www.otap-oregon.org/index.html>

Wisconsin Assistive Technology Initiative, Wisconsin Department of Public Instruction

[www.wati.org](http://www.wati.org)

### Quality Indicators

Quality Indicators for Assistive Technology

<http://www.qiat.org>

### AT Training

Alliance for Technology Access (ATA)

[www.ataccess.org/](http://www.ataccess.org/)

Assistive Technology-Strategies, Tools, Accommodations and Resources (ATSTAR) Program

[www.atstar.com](http://www.atstar.com)

The Assistive Technology Training Online Project (ATTO), University of Buffalo

<http://www.atto.buffalo.edu/>

SET-BC Provincial Resource Program

[www.setbc.org/](http://www.setbc.org/)

Special Needs Opportunity Window (SNOW)

<http://snow.utoronto.ca/>

Technology Integration, Linda J. Burkhart

<http://www.lburkhart.com>